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AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

ASSESSING EFFECTS-BASED OPERATIONS
CRUCIAL FEEDBACK FOR THE AIR COMPONENT
COMMANDER

by

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A Research Report Submitted to the Faculty

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Contents

	<i>Page</i>
DISCLAIMER	ii
LIST OF ILLUSTRATIONS	v
LIST OF TABLES	vi
PREFACE	vii
ABSTRACT	viii
INTRODUCTION	1
Overview of Paper	3
Initial Terms	3
Operational Level of War	3
Commanders	4
Effects-Based Operations	5
Battle Damage Assessment	6
DOCTRINAL DEFINITIONS AND CONFUSION	11
Combat Assessment in Joint Guidance	12
Targeting’s Non-Standard “Combat Assessment” Definition	16
Operational Assessment in Air Force Guidance	18
Summary	22
OPERATIONAL ASSESSMENT AS PART OF THE JFACC’S OODA LOOP	26
The JFACC as an Operational Commander	27
Boyd and the OODA Loop	27
Assessment and the JFACC’s OODA Loop	28
Operational Assessment Mission Statement	30
WHAT TO ASSESS	32
Effort—Planned and Actual	34
Interaction With the Enemy and the Environment	36
Effects—Enemy Behavior	36
Summary	38
CONCLUSION	41

APPENDIX A: SUMMARY OF JOINT AND AIR FORCE GUIDANCE ON ASSESSMENT	44
GLOSSARY	48
BIBLIOGRAPHY	50

Illustrations

	<i>Page</i>
Figure 1, Joint Aerospace Operations Center Organization	5
Figure 2, Overview of Battle Damage Assessment	7
Figure 3, Joint Air Tasking Cycle.....	12
Figure 4, Joint Combat Assessment Process.....	14
Figure 5, Division of Joint Targeting Responsibilities in JP 3-60.....	15
Figure 6, Non-Standard Combat Assessment	17
Figure 7, Breadth of Non-Standard Approach to Combat Assessment	17
Figure 8, AFPAM 14-210's Damage Assessment Matrix	18
Figure 9, Air and Space Assessment, Planning, and Execution Process	19
Figure 10, Operational Assessment in the Air Tasking Cycle.....	21
Figure 11, Simple OODA Loop	28
Figure 12, Full OODA Loop.....	29
Figure 13, Interacting OODA Loops	33
Figure 14, Data for Comprehensive Operational Assessment	38

Tables

	<i>Page</i>
Table 1, Summary of Joint Assessment Guidance.....	45
Table 2, Summary of AF Assessment Guidance	46

Preface

I approached this topic with a deep sense of history, since my Air Force “Scientific Analyst” career field had its start in Eighth Air Force’s Operational Analysis Section assessing bombing accuracy over Europe in 1943. Air Force operations research departed from the WWII tradition of directly supporting wartime commanders in the decades afterwards, especially after the advent of “systems analysis” under Secretary McNamara. We only returned to it during Operation Allied Force when analysts and other personnel of the Warrior Preparation Center deployed to the Vincenza Combined Air Operations Center in April 1999. The innovative efforts by these analysts paid big dividends for Lt Gen Short, the CFACC, and led to a CORONA decision to permanently place analysts in warfighting numbered air forces. Because of their hard work, Air Force operations analysts have deployed forward to assess air operations over Afghanistan during Operation Enduring Freedom and now Iraq in Operation Iraqi Freedom. Thanks to them, we’re back in the fight.

I also want to extend my appreciation to Lt Col Paul Berg, whose Air Command and Staff College elective, “Airpower Effectiveness Assessment – Past, Present, and Future,” is probably the only place in the Air Force where assessment at the operational level is taught in its full historical context.

And always, I want to thank my very understanding wife, JP, who patiently listened to me rant about how our CAOCs have *got* to run better when I got back from Saudi Arabia.

For Clayton Thomas, *in memoriam*.

Abstract

Effects-Based Operations depend on two things: smart operational objectives that accomplish the desired political goals, and feedback on the progress toward achieving those objectives. As an operational-level commander, the Joint Forces Air Component Commander (JFACC) needs operational-level feedback, and today's Joint and Air Force guidance covering that feedback is insufficient for the need. Therefore, fixing the "assessment problem" requires going back to first principles about the feedback requirements of the air commander at the operational level of war. Col John Boyd's theory of war emphasizes the dominance of time in warfighting decision-making and his Observe-Orient-Decide-Act (OODA) loop is an appropriate foundation for determining the way air component assessment should be done. The JFACC needs the assessment function to improve the speed and accuracy of his OODA loop by providing feedback on friendly efforts, the interaction of those efforts with the enemy and the environment, and the effects on enemy behavior. Joint and Air Force publications should be revised accordingly to guide the organization, training, and equipping of Joint Aerospace Operations Centers in preparing for the demanding task of assessing air operations.

Chapter 1

Introduction

The focus at a given level of war is not on the specific weapons used, or even on the targets attacked, but rather on the desired effects.

—Air Force Doctrine Document 2, *Organization and Employment of Aerospace Power*

In response to the complexity of modern air campaigns, the Air Force has focused its training more on tactics, techniques, and procedures than on results-based evaluation and implementation of courses of action at the operational and strategic levels.

—HQ USAF, *The Air War Over Serbia Initial Report*

The more important something is, the harder it is to measure.

—Lt Col Peter L. Hays

For over a decade, the American military has been slowly moving from a paradigm of warfare as conquering the enemy toward a more flexible concept more appropriate to the post-Cold War geopolitical environment. This evolving approach focuses on achieving success across the entire spectrum of conflict by establishing appropriate objectives and taking specific actions creating the effects that lead to their achievement. The current expression of this idea is called Effects-Based Operations (EBO).¹ Successful EBO depends on feedback about the effects actually created, so that plans can be adjusted to fit reality. This feedback, also known as assessment, is an enormous challenge in applying EBO in air and space operations.

The crux of assessment is having selected information available regarding the consequences

of actions taken, in order to determine the rate and direction of progress in executing one's strategy.² Accurately assessing, predicting, and observing effects have been the bane of airmen since the earliest uses of combat airpower,³ however, complicating the application of EBO from the air. The recent increased accuracy of weapons and tempo of warfare have driven a corresponding increase in the detail and accuracy of information needed for assessment. Unfortunately, feedback on air operations has been one of the Air Force's least concerns.⁴

Feedback efforts by the intelligence community focused on battle damage assessment (BDA).⁵ As the complexity of air warfare increased, however, BDA failed to meet the challenge, most notably in Desert Storm,⁶ driving an evolution of assessment concepts and procedures to solve the problem. There have been more than 15 articles and publications in the Air University system alone since 1993 discussing BDA inadequacies and other assessment concerns. They document how the neglect of assessment during peacetime training and planning from Vietnam to Operation Allied Force has created an inadequately resourced and trained process facing enormous challenges during actual conflict.⁷ BDA is still the most visible product of the assessment function and has the broadest audience, unfortunately relegating new assessment ideas to obscurity.⁸

The importance of feedback on air operations and the extreme difficulties in providing it form the basis of the "assessment problem," which is needlessly exacerbated by the poor quality of Joint and Air Force guidance on assessment. This paper contends that this inadequate treatment in doctrine and other instructions compounds the inherent difficulty of air assessment, and that the resulting poor capability to judge the results of joint air operations, both combat and combat support, cripples our attempts to successfully apply the concepts of EBO at the operational level. This demands correction.

Dispersing the confusion in our guidance requires going back to first principles to understand the fundamental purpose of air assessment. This paper attempts to meet that need, using Col John Boyd's concept of the Observe-Orient-Decide-Act (OODA) loop to describe the air component commander's operational decision-making and establish the general types of feedback he needs.

Overview of Paper

This introduction explains the nature of the problem in assessing air operations at the air component level and outlines some basic terminology used in air assessment. Chapter 2 examines the doctrinal confusion about assessment and responsibilities in Joint and Air Force publications. Chapter 3 takes a broader perspective on assessment, using Col John Boyd's OODA loop to examine assessment as feedback improving the situational awareness of the air component commander. Chapter 4 explores the full spectrum of the measures of effectiveness that should be used to assess air operations. Chapter 5 concludes with a summary and recommendations. A summary of how assessment is discussed in Joint and Air Force publications is attached as an appendix.

Initial Terms

Since part of the "assessment problem" is confusion over terminology, this paper must start with a solid foundation to untangle the mix of words and meanings found in today's Joint and AF publications.

Operational Level of War

Often the most basic source of confusion about measuring effects comes from poor understanding of the level of war involved. Air Force Doctrine Document (AFDD) 2,

Organization and Employment of Aerospace Power, describes the tactical level of war as that end of the spectrum of conflict where individual engagements and battles are fought and targets are attacked. At the other end of the spectrum, issues at the strategic level include national political and military objectives, theater objectives, and the capabilities to wage war. The operational level lies in between and deals with planning and executing campaigns and major operations, focusing on *what* we attack, in what *order*, and for *how long*. Operational art, the process of deriving tactical tasking from strategic guidance, is critically important here.⁹

The level of the effect being pursued drives how to measure progress toward it. For example, an entirely different approach must be taken to assess if an adversary leader is being successfully coerced rather than telling if a surface-to-air missile (SAM) acquisition radar is out of commission. Knowing the appropriate level of war is fundamental to successful assessment.

Commanders

Assessment of air operations directly involves two commanders—the overall Joint Force Commander (JFC) and his subordinate functional air commander, the Joint Force Air Component Commander (JFACC). The JFC is assigned a mission in a specified Area of Responsibility (AOR) and determines the appropriate military objectives to accomplish that mission. He is supported by service component commanders and designates functional component commanders as needed.¹⁰ The JFC normally operates at the operational level of war.

The JFACC is the only functional component commander whose designation is recommended by Joint doctrine.¹¹ He recommends the proper employment of air and space forces from multiple services and is generally delegated operational control (OPCON) of assigned and attached forces and tactical control (TACON) of certain other military capabilities by the JFC. Because of the AOR-wide scope of air and space operations, the JFACC will

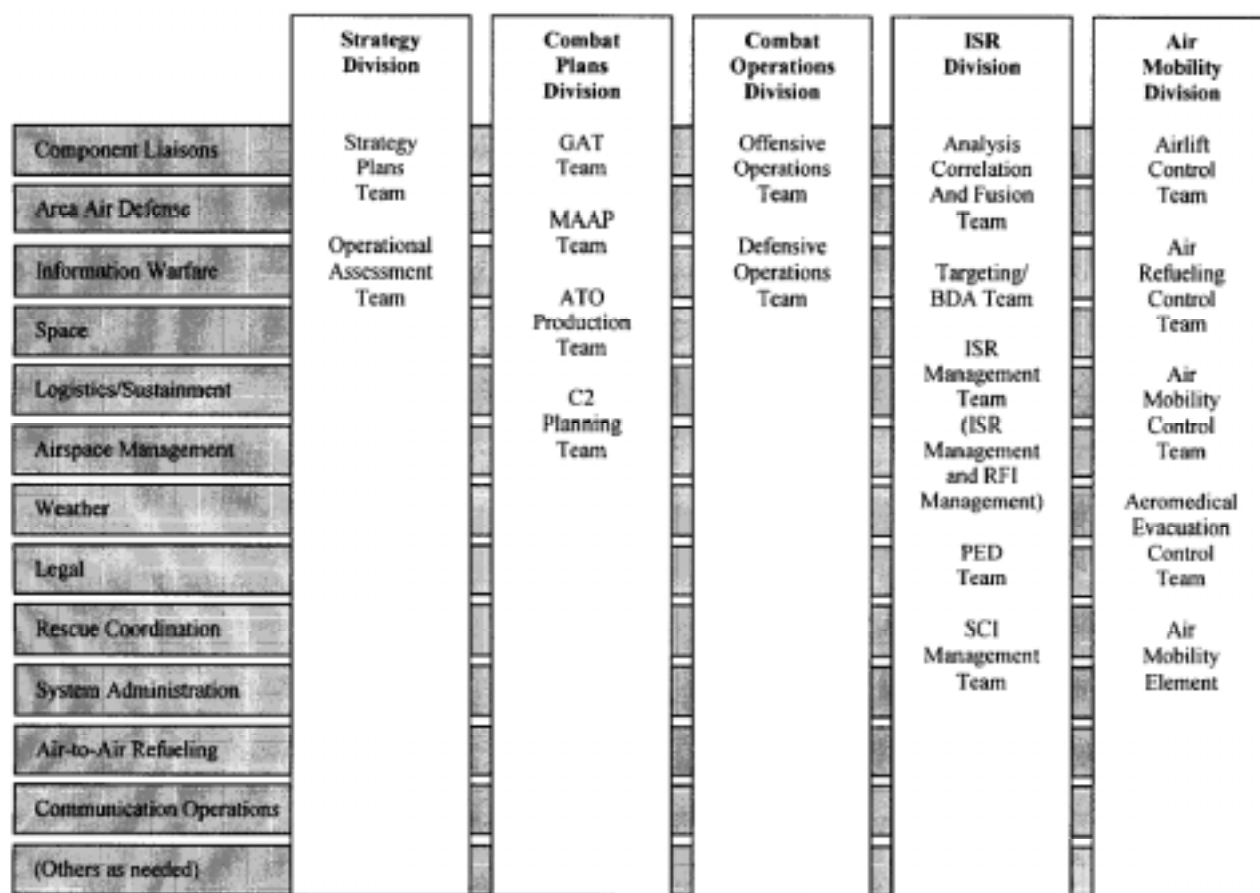


Figure 1, Joint Aerospace Operations Center Organization¹²

typically maintain the same theater perspective as the JFC.¹³

The JFACC's command center is the Joint Aerospace Operations Center (JAOC), which is tasked with centralized planning, direction, control, and coordination of the air and space operations that the JFACC has OPCON/TACON of.¹⁴ It has five divisions—Strategy; Combat Plans; Combat Operations; Intelligence, Surveillance, and Reconnaissance (ISR); and Air Mobility¹⁵—and multiple crosscutting teams (see Figure 1). The JAOC engages in a continuous cycle of assessing, planning, and executing air and space operations,¹⁶ including the assessment of operational-level effects.

Effects-Based Operations

EBO is one of today's most influential concepts in military planning. While not a new idea,

EBO at the operational level of war is expressed through attacking adversary capabilities and thinking specifically to efficiently and discriminately accomplish the JFC's objectives.¹⁷ Although there is not yet a commonly accepted definition of the term, the January 2000 draft replacement of AFDD 2-1.2, *Strategic Attack*, defines "effects-based" as military actions, such as operations, targeting, or strategy, that are designed to produce distinctive and desired results.¹⁸ The aim of EBO is to use target destruction (or some other effect via nonlethal means) to create these results at the operational and strategic levels of war, which in turn compel enemy leaders to respond in ways that meet our overall campaign objectives.¹⁹ The intent is to control the enemy.²⁰ EBO is less a specific procedure than a strategy-to-task mindset focused on evaluating the achievement of these desired results, rather than on pseudo-objectives such as the destruction of target lists for their own sake.²¹

The draft replacement for AFDD 2-1.2 states that the keys to successful EBO are careful analysis of national and JFC objectives to determine the requisite effects needed to accomplish them and *continual assessment of the ongoing effects* to ensure progress is being made toward achieving those objectives.²² Feedback on the desired effects, not target status, determines subsequent action.²³ Successful EBO demands flexibility, seeing what has been accomplished and adjusting efforts as needed.²⁴ In other words, EBO requires knowledge.²⁵

Battle Damage Assessment

Knowledge of the results of air operations is not easy to get, however. Discovering the actual damage done to targets from the air has been difficult for airmen since the earliest days of military airpower and, even with modern sensor capabilities, it remains a thorny problem.²⁶ While this process was once called "bomb damage assessment," the concept has been expanded over time to address assessment of target damage regardless of means. The current Joint

BATTLE DAMAGE ASSESSMENT OVERVIEW			
Battle Damage Assessment Phase	Results	Responsible Organization	Data Sources
Phase 1 (Physical Damage Assessment)	<ul style="list-style-type: none"> Initial Physical Damage Assessment (hit or miss) 	<ul style="list-style-type: none"> Unit, Combatant Command, Subordinate Joint Force Commander (JFC), National 	<ul style="list-style-type: none"> Debriefs Forward Observer Weapon System (Aircraft Cockpit) Video Theater and National Sources
Phase 2 (Functional Damage Assessment)	<ul style="list-style-type: none"> Detailed Physical Damage Assessment Functional Damage Assessment Target System Assessment Inputs Munitions Effectiveness Assessment Comments 	<ul style="list-style-type: none"> Combatant Command, Subordinate JFC, National 	<ul style="list-style-type: none"> All-Source
Phase 3 (Target System Assessment)	<ul style="list-style-type: none"> In-Depth Target System Assessment 	<ul style="list-style-type: none"> Combatant Command, Subordinate JFC, National 	<ul style="list-style-type: none"> All-Source with Subject Matter Expert Input

Figure 2, Overview of Battle Damage Assessment²⁷

definition of BDA is:

The timely and accurate estimate of damage resulting from the application of military force, either lethal or non-lethal, against a predetermined objective. [BDA] can be applied to the employment of all types of weapon systems (air, ground, naval, and special forces weapon systems) throughout the range of military operations. [BDA] is primarily an intelligence responsibility with required inputs and coordination from the operators.²⁸

Figure 2 describes the three phases of BDA, outlining the basic results of each phase. The responsibility for BDA in the JAOC lies in the Targeting/BDA Team of the ISR Division (see Figure 1). The JFC also has a significant interest in BDA and Joint doctrine allows his intelligence staff to take the predominant role in assessing battle damage. The idea of “federated BDA” allows the JFC to leverage intelligence resources outside the theater to make the best

assessments possible.²⁹

Many think that BDA answers all damage assessment questions, but this is untrue.³⁰ BDA's core concept is that *it reports the status of targets we attack* and so is an assessment of immediate, or first-order, effects. Obviously, feedback on the condition of targets struck from the air is fundamentally necessary to command offensive air operations. BDA is one of the most important building blocks of the air commander's situational awareness, but it only assesses the direct results of friendly actions—not the enemy decisions and behavior we target at the operational level. The significant investment of time, personnel, and assets required to overcome the enormous difficulties involved in BDA obscures the fact that BDA is only a piece of air assessment.

Target-focused BDA alone does not provide enough information to command at the operational level—the JFC and JFACC need much more. The inadequacies of Joint and AF efforts to meet that need are what motivate this paper.

Notes

¹ Col Edward C. Mann III, retired, Lt Col Gary Endersby, retired, and Thomas R. Searle, *Thinking Effects: Effects-Based Methodology for Joint Operations*, CADRE Paper 15 (Maxwell AFB, AL: Air University Press, October 2002), 1-4.

² Beagle, 11.

³ Maj Kevin B. Glenn, "The Challenge of Assessing Effects-Based Operations in Air Warfare," *Air & Space Chronicles*, 24 April 2002, n.p., on-line, Internet, 12 February 2003, available from <http://www.airpower.maxwell.af.mil/airchronicles/bookrev/glenn.html>.

⁴ Maj Mark G. Sopko, "Combat Assessment: Analyzing the Results of an Air Campaign," *Air & Space Power Chronicles*, 15 November 1999, n.p., on-line, Internet, 12 February 2003, available from <http://www.airpower.maxwell.af.mil/airchronicles/cc/sopko.html>.

⁵ Sopko.

⁶ The inability to accurately assess the number of Iraqi tanks, armored personnel carriers, and artillery knocked out from the air was found to be the greatest intelligence failure of the 1991 Persian Gulf War by the House Armed Services Committee, while the formal Department of Defense report on the war identified BDA as one of four intelligence shortcomings. Sopko. Maj Judy M. Graffis, "Do the Army and Air Force See Eye to Eye on BDA?" (monograph, School of Advanced Military Studies, US Army Command and General Staff College, 9 December 1996), 1. The theater BDA process also could not provide feedback on the systemic

Notes

effects created by air attack, forcing Desert Storm air planners to rely on strategic assessments secure-faxed from US-based organizations. BGen David A. Deptula, *Effects Based Operations: Change in the Nature of Warfare* (Arlington, VA: Aerospace Education Foundation, 2001), 29 (note 35).

⁷ These include Glenn, Sopko, Beagle, Mann et. al., and Drew already mentioned. See also Smith, Bailey, Owen, Sargent, McLaughlin, Whidden, Lewis, McKeon, Smith, and Szafranski in the bibliography. The latest, a School of Advanced Air & Space Studies thesis on the current state of BDA by Lt Col John Rauch, is still undergoing security and policy review and should be published later in 2003.

⁸ Air Force Pamphlet (AFPAM) 14-210, *USAF Intelligence Targeting Guide*, 1 February 1998, 69.

⁹ Air Force Doctrine Document (AFDD) 2, *Organization and Employment of Aerospace Power*, 17 February 2000, 2-3. Emphasis in original.

¹⁰ AFDD 2, 48.

¹¹ Damian J. McCarthy and Susan A. Medlin, "Two Hats for the Joint Force Commander?," *Joint Force Quarterly*, Summer 2000, 92.

¹² Air Force Instruction (AFI) 13-1AOC Volume 3, *Operational Procedures–Air Operations Center*, 1 July 2002, 16.

¹³ AFDD 2, 54. Joint Publication (JP) 3-56.1, *Command and Control for Joint Air Operations*, 14 November 1994, II-2.

¹⁴ JP 3-56.1, II-6. AFDD 2, 71. "Since aerospace operations are normally joint/combined in nature, the (COMAFFOR's Aerospace Operations Center) normally functions as a JFACC command center; thus, the AOC becomes the Joint Aerospace Operations Center (JAOC) or Combined Aerospace Operations Center (CAOC)." AFI 13-1AOCV3, 7.

¹⁵ AFI 13-1AOCV3, 15.

¹⁶ AFDD 2, 72.

¹⁷ Paul K. Davis, *Effects-Based Operations: A Grand Challenge for the Analytic Community*, RAND Report MR-1477-USJFCOM/AF (Santa Monica CA: RAND, 2001), 1-2.

¹⁸ Davis, 7. Draft AFDD 2-1.2, *Strategic Attack*, 1 January 2000, 9, on-line, Internet, available from <https://www.doctrine.af.mil/Library/Doctrine/afdd2-1-2draft.pdf>.

¹⁹ Maj T. W. Beagle, Jr., *Effects-Based Targeting: Another Empty Promise?* (Maxwell AFB, AL: Air University Press, December 2001), 5.

²⁰ Deptula, 11.

²¹ Beagle, 10. Col Edward Mann, Lt Col Gary Endersby, and Tom Searle, "Dominant Effects: Effects-Based Joint Operations," *Aerospace Power Journal*, Fall 2001, 93.

²² Draft AFDD 2-1.2, 9. Emphasis added.

²³ Beagle, 11.

²⁴ MGen Stanley McChrystal, Operation Iraqi Freedom press conference, Pentagon, 22 March 03.

²⁵ Gen Charles A. Horner, retired, "Men and Machines in Modern Warfare," Norway, 2003, 2.

²⁶ Col Dennis M. Drew, "The Essence of Aerospace Power: What Leaders Need to Know," *Aerospace Power Journal*, Summer 2001, 25. In World War II, the information available to the Allied on the effects of bombing German industrial systems was derived primarily from aerial

Notes

photography, supplemented with prisoner of war interrogations and friendly agents working behind enemy lines. Sopko. Pre- and post-strike reconnaissance was augmented by “strike cameras” mounted under bombers to record the fall of the formation’s bombs. Charles W. McArthur, *Operations Analysis in the U.S. Army Eighth Air Force in World War II*, History of Mathematics Vol. 4 (Providence, RI: American Mathematical Society, 1990), 31, 336-7. Fighter strike cameras were installed during Vietnam for the same purpose and were used for BDA at the fighter squadrons. The entire tactical BDA process built from WWII to Vietnam had decayed by Desert Storm, however. The use of strike cameras had been completely discounted in favor of external imagery collected by a combination of reconnaissance aircraft, satellites, and unmanned aerial vehicles, which could not deliver timely BDA to the campaign planners or aircrew. Cockpit video systems which recorded the pilot’s heads up display, originally installed for aircrew training, provided some immediate feedback, but the theater’s post-strike reconnaissance process failed to deliver BDA adequate for restrike and campaign decisions. Lt Col Kevin W. Smith, *Cockpit Video: A Low Cost BDA Source* (Maxwell AFB, AL: Air University Press, December 1993), xiv, 1-3, 19-27. Eight years later in Allied Force, problems with timely, accurate BDA also appeared. Beagle, 76.

²⁷ JP 2.01-1, *Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting*, 17 January 2002, E-2.

²⁸ JP 3-0, *Doctrine for Joint Operations*, 10 September 2001, GL-5.

²⁹ JP 2-01.1, VI 2-4.

³⁰ Sopko.

Chapter 2

Doctrinal Definitions and Confusion

How many a dispute could have been deflated into a single paragraph if the disputants had just dared to define their terms.

—Aristotle

In order to discuss assessment of joint air component EBO, there must be a common point of departure. Unfortunately, that point is very blurred in today's doctrine. As of this writing, assessment is discussed in eleven Joint and eleven Air Force doctrine documents in addition to several lower level publications. Despite this frequent mention, there is a significant absence of guidance covering operational-level assessment and feedback for the JFACC.¹ What does exist includes contradictory definitions and assignments of responsibility that obscure accurate feedback and increase friction in the command and control (C2) of joint air and space power.

These publications use three different terms for the assessment function: "combat assessment," a phrase found in many Joint doctrine publications; the non-standard "combat assessment" defined in certain Joint and Air Force targeting publications; and "operational assessment" used in some Air Force guidance. Unfortunately, a complete analysis of relevant guidance is outside the scope of this paper. A tabular summary of Joint and AF publications mentioning assessment is found in Appendix A. This chapter will explore the three different definitions to establish the confusion that surrounds assessment today and serve as, if not a point, at least a "cloud" of departure.

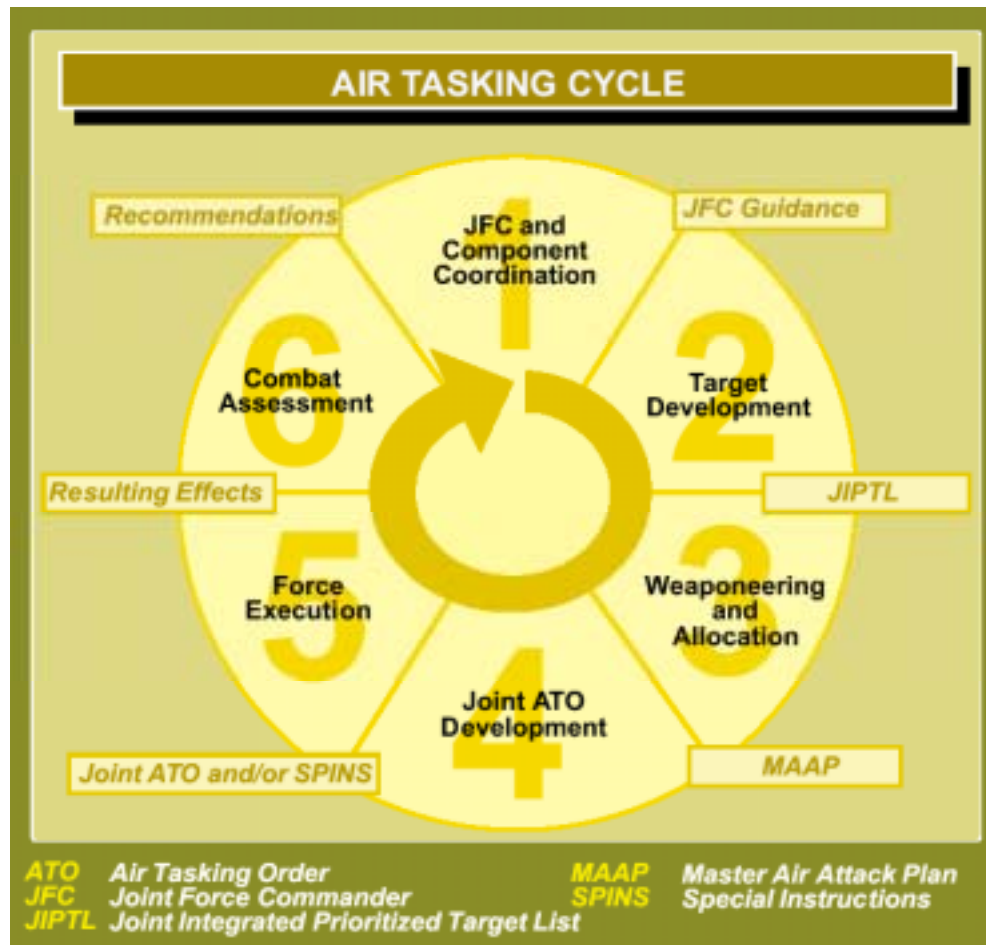


Figure 3, Joint Air Tasking Cycle²

Combat Assessment in Joint Guidance

Joint guidance discusses feedback on combat operations by including it as a part of the joint air tasking cycle (see Figure 3). The doctrinal keystone Joint Publication (JP) 3-0, *Doctrine for Joint Operations*, calls this function **combat assessment** (CA) and defines it as “*the determination of the overall effectiveness of force employment during military operations.*”³ While many Joint publications use this term, its meaning in each publication ranges from broad feedback at the tactical, operational, and strategic levels of war to narrowly focused observations on the status of targets struck from the air.

Published in 2001, JP 3-0 discusses CA as a key JFC concern during sustained combat

operations. At the JFC level, CA is a joint effort to determine if the JFC's envisioned effects on the adversary are being achieved through analyzing what is known about the damage inflicted on the enemy. This includes assessing psychological as well as physical attrition of the adversary, impact on adversary plans and capabilities, and any adjustments of effort needed to achieve the objectives of the current phase of operations. CA requires constant information flow from all sources and is done at all levels of the joint force, including the components. The JFC's Operations Directorate (J-3) will normally be responsible for coordinating CA, assisted by the Intelligence Directorate (J-2).⁴

JP 3-0's glossary entry for CA, taken from JP 1-02, gives CA a very different connotation.

Repeating the definition given on the preceding page, it continues with:

Combat assessment is composed of three major components, (a) battle damage assessment, (b) munitions effects assessment, and (c) reattack recommendations. The objective of combat assessment is to identify recommendations for the course of military operations.⁵

The joint definition of BDA was given in Chapter 1. Munitions Effects Assessment (MEA) is:

Conducted concurrently and interactively with [BDA], the assessment of the military force applied in terms of the weapon system and munitions effectiveness to determine and recommend any required changes to the methodology, tactics, weapon system, munitions, fusing, and/or weapon delivery parameters to increase force effectiveness.⁶

MEA includes both short-term feedback for the operators flying in the current operation and long-term analysis for weapons development and acquisition.⁷ The Reattack Recommendation (RR), sometimes called future targeting and reattack recommendation, is:

An assessment, derived from the results of [BDA] and [MEA], providing the commander systematic advice on reattack of targets and further target selection to achieve objectives. The reattack recommendation considers objective achievement, target, and aimpoint selection, attack timing, tactics, and weapon system and munitions selection.⁸

Figure 4 sums up JP 1-02's guidance on CA. Its definitions of CA, BDA, MEA, and RR

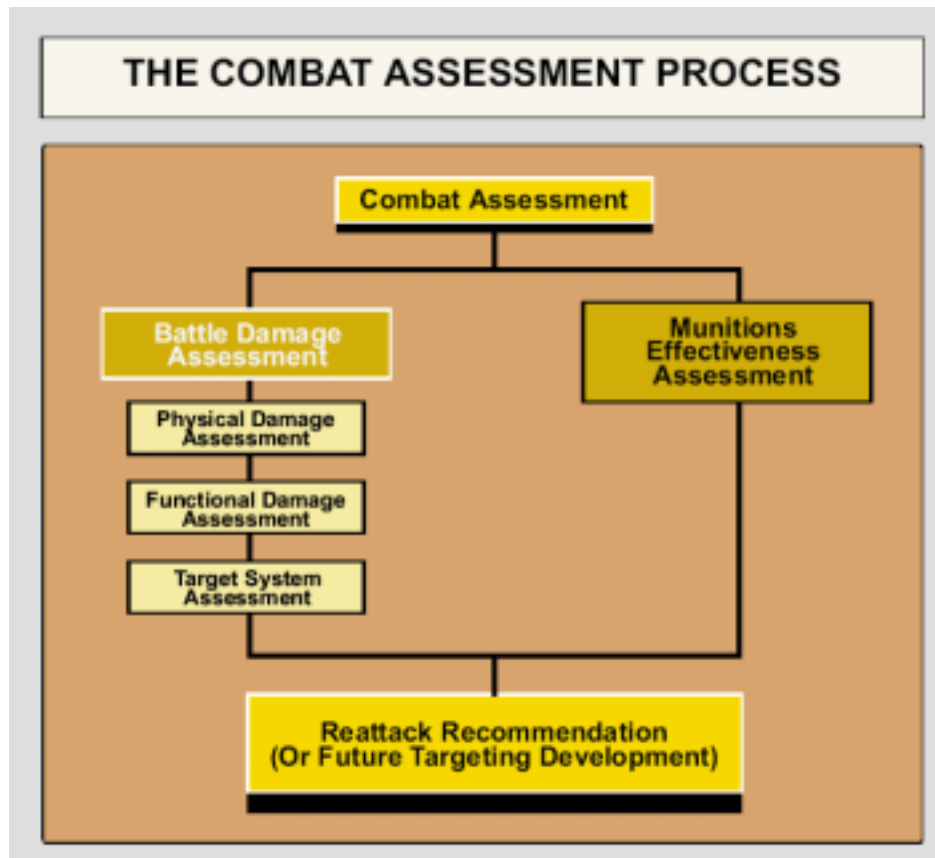


Figure 4, Joint Combat Assessment Process⁹

leave out the broader issues in JP 3-0's main text. This reveals the fundamental weakness of the Joint concept of CA as it currently exists—the lack of clarity about assessing operational-level effects. Does CA include feedback on operational-level concerns of the JFC as in JP 3-0, or is it limited to just the steps of Figure 4, in essence just CA = BDA+MEA+RR?

The confusion over the broad vs. narrow interpretation of CA continues throughout other Joint publications, as summarized in Table 1. JP 3-09, *Doctrine for Joint Fire Support*, tasks the J-3 to coordinate the joint force's CA efforts, but tasks the J-3 just two subparagraphs later to conduct assessments of the campaign or major operation as well, implying CA doesn't include assessment of the overall campaign.¹⁰ JP 3-56.1, *Command and Control for Joint Air Operations*, takes both the narrow and broad interpretations in its pages.¹¹ JP 3-60, *Joint*



Figure 5, Division of Joint Targeting Responsibilities in JP 3-60¹²

Doctrine for Targeting, has the best treatment of the broad CA approach, saying, “The end product of CA at the operational and/or strategic level is a campaign assessment that is incorporated into strategy and guidance development.”¹³ There is more, as shown in Table 1, but two things stand out. The first is the unresolved mix of broad and narrow interpretations in Joint doctrine publications. The second is that even the publications that describe the broad approach spend far more pages describing the details of BDA, MEA, and RR than how to accomplish CA at the operational level, leaving the reader with the inescapable conclusion that narrow, target-focused CA is more important.

A related weakness in Joint doctrine is the vague assignment of responsibilities for CA.¹⁴ At

the command level, JP 3-56.1 specifically tasks the JFACC with evaluating the results of joint air operations and forwarding combat assessments to the JFC to support the overall CA effort. Both the JFC and JFACC staffs are charged with continuously evaluating the results of joint air operations and providing their feedback to the JFC for consolidation and overall evaluation of the current campaign.¹⁵ JP 3-60 takes a different approach, saying that the JFC is responsible for all aspects of joint targeting, including CA. While its statement that “CA is done at all levels” and the graphic reproduced in Figure 5 suggests that the components are intimately involved, JP 3-60 only tasks components to provide BDA to the JFC.¹⁶ Not only is the issue of whether or not doctrinal CA includes operational-level assessment of air operations left unresolved, but also so is the question of whether the JFACC can assess the efforts of his assigned and attached forces toward achieving his air component objectives.¹⁷

Targeting’s Non-Standard “Combat Assessment” Definition

The operational-level void in standard Joint assessment doctrine has been addressed in some AF and Joint publications authored by members of the intelligence community by changing the definition of CA (see Tables 1 and 2). Instead of the “CA = BDA+MEA+RR” formula of JP 1-02, they instead replace the reattack recommendation with “mission assessment” (MA), a term that can be interpreted to include operational-level assessment (see Figure 6).¹⁸

The definition of MA varies from document to document. AFDD 2-5.2, *ISR Operations*, says MA “evaluates the effectiveness of a tasked or apportioned mission on the adversary’s warfighting and sustaining capabilities.”¹⁹ The 1998 Air Force Instruction (AFI) 14-117, *Air Force Targeting*, says MA:

Addresses the effectiveness of a particular mission ([offensive counterair, interdiction, strategic attack]). Provides broad perspective of the impact and effectiveness of military operations waged against an adversary. While BDA and

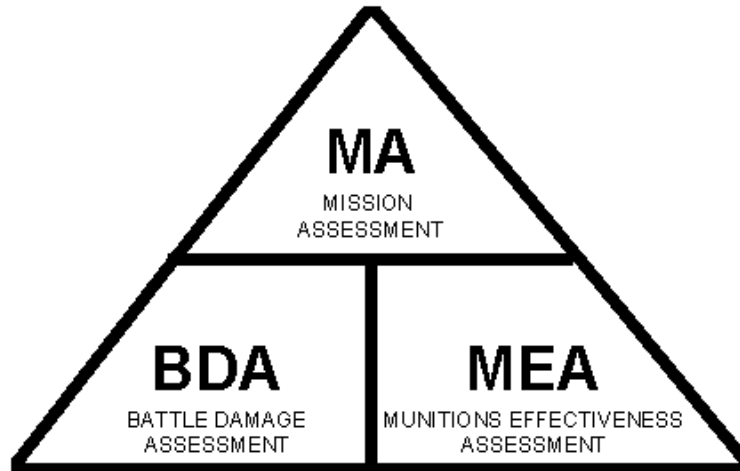


Figure 6, Non-Standard Combat Assessment²⁰

MEA address lethal force employment against individual target systems and weapons, MA evaluates the impact of assigned missions and apportionment.²¹

Air Force Pamphlet (AFPAM) 14-210, *USAF Intelligence Targeting Guide*, has the most detailed and ambitious discussion of this approach to assessment. It interprets MA as covering operational missions such as interdiction or counterair, instead of just individual sorties. Despite

Combat Assessment Covers All Levels

Level of Warfare	Assessment Criteria	Assessment Types
Campaign – Strategic	National & Theater Objectives/Guidance	Campaign CA Mission Assessments
Components – Operational	Missions, Objectives, & Measures of Merit	Component CA Mission Assessments Battle Damage Assessment Munitions Effectiveness
Combat Units – Tactical	Missions, Objectives, & Tasking Orders	Unit CA Mission Assessment Munitions Effectiveness Battle Damage Assessment

Figure 7, Breadth of Non-Standard Approach to Combat Assessment²²

Air-Surface Damage Assessment Matrix(Who We Supply CA/BDA To)				
Phase	1	2	3	3
~ Time (see Note)	<24 Hours	1-3 Days	4 Days - Weeks	4 + Days-Weeks
Decision Cycle	ATO Execution	ATO Generation	Air Operations Planning	Theater Campaign Planning
Decision Aids	Raw Intel Mission Reports 1st Phase Reports Databases Target Materials Some Images	Fused Intel Mission Reports 1-3 Phase Reports Databases Target Materials Images	Intel Analysis 1-3 Phase Reports Databases Target Materials Strike Histories	Intel Analysis 1-3 Phase Reports Databases Target Materials Components' Assessments
Decision makers	Combat Operations	Combat Plans	Long Range Plans	JF-CINC/J3
Location	Air Operations Center			JF HQ
Supporting Intelligence Organizations	JFACC/Other Components Minimal Image Nat Supt Theater Assets	Theater Assets National Assets	JICs National Agencies	JICs National Agencies

Figure 8, AFPAM 14-210's Damage Assessment Matrix²³

being an AF publication, AFPAM 14-210 describes CA for the JFC in some detail as well as for the JFACC, including the importance of establishing measures of merit for all objectives and how CA must be “done jointly by targeteers, operators, engineers, and intelligence analysts.”²⁴ Figures 7 and 8 show how AFPAM 14-210's concept of CA covers the waterfront of tactical, operational, and strategic feedback.

Operational Assessment in Air Force Guidance

AF publications tend toward more comprehensive views of assessment than found in Joint doctrine. AFDD 2, *Organization and Employment of Aerospace Power*, describes assessment as a part of the fundamental cyclical JAOC process:

Assessment is done at all levels of command. It is how commanders conduct operational environment research and develop [courses of action]. The commander should establish a dynamic system to support assessment for all components. Assessment includes evaluation of resource constraints and operations effectiveness to achieve command objectives. Effective campaign planning and execution require a continuing evaluation and assessment of the impact of joint force operations and resource constraints on the overall campaign.

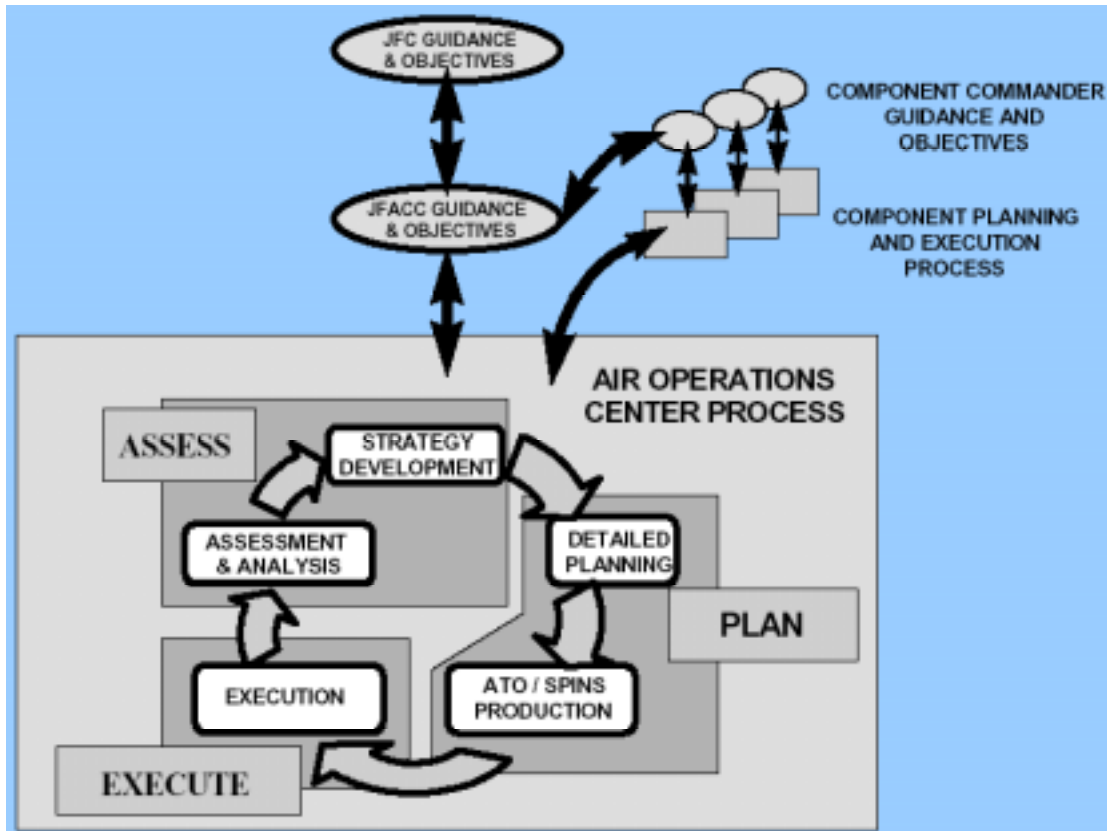


Figure 9, Air and Space Assessment, Planning, and Execution Process²⁵

At the completion of any assigned task or mission objective, a combat assessment is performed at all levels of command to evaluate the effectiveness of the operation. This assessment provides the basis for further refinement or development of a revised campaign plan or the establishment of new operational tasks or objectives.²⁶

This extremely broad description is more a statement of philosophy about JAOC operations than the guidance seen in Joint and targeting publications, but it emphasizes that JAOCs run on information and require feedback for success (see Figure 9).

Definitions of assessment in AF guidance change almost publication by publication, but generally use the Joint CA definition, the non-standard “CA = BDA+MEA+MA” approach, or the non-Joint term “**operational assessment**” (OA) to describe assessing effects at the operational level of war. Some include more than one (see Table 2).

There is no single authoritative Air Force definition for OA, making the confusion that much

worse. The January 2000 AFDD 2-1, *Air Warfare*, defines OA as “the measurement of effects at the operational level. Operational assessment determines whether or not force employment is properly supporting overall strategy by meeting operational objectives.”²⁷ The current AFDD 2-1.2 describes OA in a small section on developing and attacking centers of gravity, calling it assessing the success of the attack and studying the overall impact on adversary strategy.²⁸ While the 2000 draft AFDD 2-1.2 doesn’t define OA explicitly, it discusses how critical OA is to successful effects-based strategic attack.²⁹

AFDD 2-1.3, *Counterland*, is the only AF doctrine that explicitly defines and describes both CA and OA. It tasks the overall counterland assessment effort “to measure effectiveness and recommend future action” and emphasizes that it “occurs at the tactical, operational, and strategic levels and is accomplished in some form or another by almost every part of the counterland force.”³⁰ It uses the joint definition of CA and briefly explains the BDA/CA process for close air support. But the real value lies in the distinction between CA and OA:

*Although not yet a standardized joint term, operational assessment is often referred to as the operational-level assessment of friendly operations against the enemy. It occupies a higher level than combat assessment and includes the overall analysis of enemy operations, their reaction to friendly operations, and recommendations for changes or adjustments to friendly strategy based on overall observations. Operational assessment builds on the daily observations and recommendations of combat assessment and identifies such things as when phase objectives have been met and when friendly operations should proceed to the next phase of the campaign...In general terms, combat assessment measures the effectiveness of the counterland operation, while operational assessment measures how the effects of counterland operations relate to the overall theater strategy.*³¹

Recent AF guidance continues this approach, describing the more narrow, target-focused “CA” function as distinct from assessing operational-level effects in “OA.” The AF Doctrine Center Handbook (AFDCH) 10-01, *Air & Space Commander’s Handbook for the JFACC*, clearly echoes AFDD 2-1.3’s approach. The term OA is now used because CA:

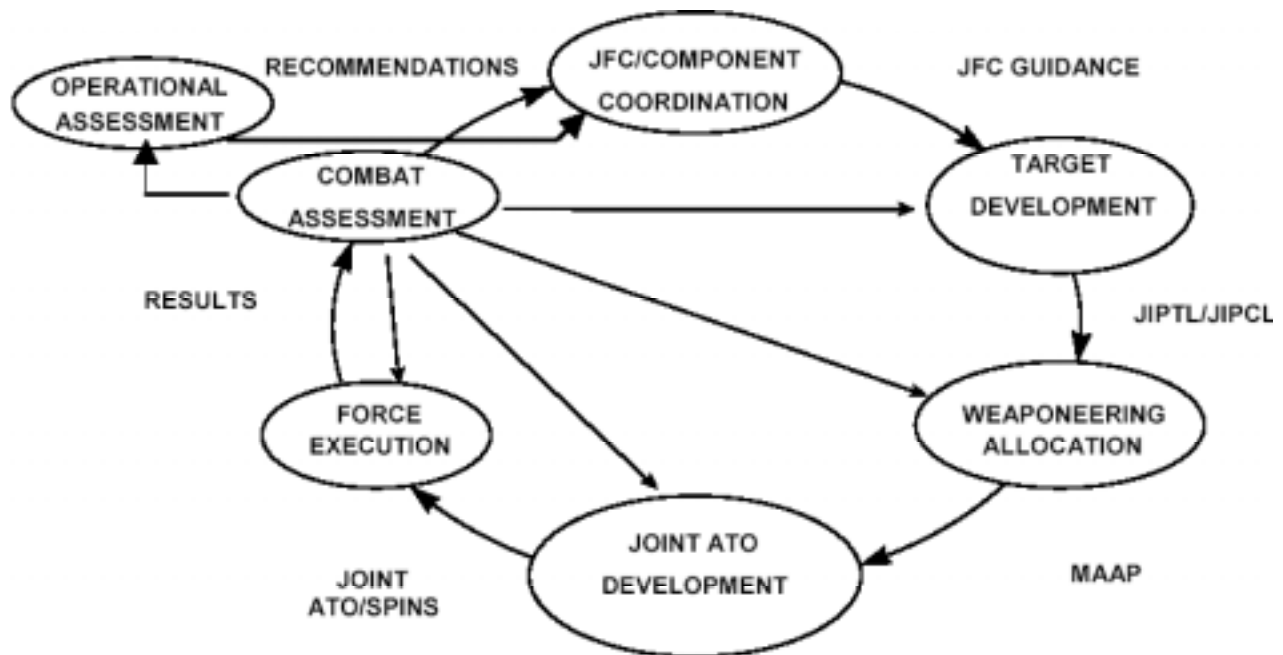


Figure 10, Operational Assessment in the Air Tasking Cycle³²

...does not fully define the information necessary for the commander to make decisions on the progress of his campaign. CA is narrowly focused, primarily using BDA as its main source. OA describes the entire assessment process (CA, [Information Operations], [Special Technical Operations], etc.) at the JFACC level.³³

AFDCH 10-01 proposes that OA be defined as “The measurement of effects at the operational level. [It] determines whether or not force employment is accomplishing overall strategy by meeting operational objectives.”³⁴ It repeats JP 3-56.1 in saying that OA of joint air and space operations is a JFACC task. OA is distinguished from strategic, campaign, and theater assessment, however, with AFDCH 10-01 saying these are accomplished at the JFC level.³⁵

AFI 13-1AOCV3, *Operational Procedures–Aerospace Operation Center*, places responsibility for OA with the OA Team in the Strategy Division (see Figure 1). While it doesn’t use the term “CA,” it tasks the ISR Division with responsibility for BDA, MEA, RR, and MA.³⁶ The 2002 AF Operational Tactics, Techniques, and Procedures (AFOTTP) 2-3.2, *Air and Space Operations Center*, agrees, this time naming CA explicitly while giving the best

description of how the OA function fits into JAOC operations.³⁷ The OA Team is a multidisciplinary group that includes intelligence personnel embedded in the Strategy Division.³⁸ This assessment approach is seen in the modified air tasking cycle shown in Figure 10.³⁹

The discussion about assessment so far has revolved around providing feedback on *combat* operations. AF mobility doctrine contains hints about the importance of assessing on-going *non-combat* operations, as well. AFDD 2-6.2, *Air Refueling*, describes how:

The [JAOC's Air Refueling Control Team] and [Air Mobility Division] chief should continually evaluate air refueling resource constraints, tanker utilization efficiency, and the overall operational effectiveness of tanker usage. This assessment should provide the basis for further refinement or development of a revised air refueling CONOPS or for changes in tanker allocation between intratheater functions or between intratheater and intertheater priorities.⁴⁰

Given the importance of air refueling in today's deployed air operations, maintaining good situational awareness on the status of a key enabling function seems to be a high priority. However, non-combat operations are not addressed in current assessment guidance.

Summary

The wide range of Joint and AF guidance contains many important concepts about operational objective-focused assessment as well as tactical target-focused feedback. JP 3-0, JP 3-60, AFPAM 14-210, and AFOTTP 2-3.2 all provide relevant guidance at the operational level. However, the disagreement in terminology and responsibilities involved in the "assessment problem" only makes a difficult problem worse. JFC and JFACC staff should not have to sift through dozens of Joint and service publications to discover how to accomplish assessment. Ultimately, the doctrinal confusion is the fault of Joint doctrine. If the published concept of CA were sufficient, the non-standard targeting "CA" and AF OA would not have appeared to fill the operational-level assessment void.

Joint doctrine concentrates on assessment for the JFC, but gives incomplete and contradictory guidance about the assessment roles and responsibilities of subordinate component commanders. The theater-wide responsibilities of the JFACC and the nature of joint air and space power suggest special consideration of the air component, but that isn't supported except in the 1994 JP 3-56.1. Instead, JFACCs from any service must turn to equally incoherent AF guidance to piece together how their air operation feedback mechanism works. The lack of comprehensive standards perpetuates idiosyncratic procedures unique to every JAOC while reinforcing the traditional peacetime neglect of BDA and assessment by impeding Joint and service training and equipping.

One of the most glaring lapses in all three assessment themes found in Joint and AF publications is the absence of feedback on combat support activities. CA of either flavor definitively excludes “non-combat” operations. OA is broad enough to include combat support, but non-combat operations are not mentioned in any detail. The concentration on combat operations neglects how Joint forces act in challenging humanitarian crises, as well as in deterrence and show of force operations that hope to prevent conflict. Some 80% of contingencies since the 1991 Gulf War have been non-combat, mobility-centric operations.⁴¹ Substantial quantitative feedback was used as a C2 tool during the Berlin Airlift⁴²—there's no reason to conclude such assessment is unimportant for JFACC decision-making.

Notes

¹ Air Force Doctrine Center Handbook (AFDCH) 10-01, *Air and Space Commander's Handbook for the JFACC*, 16 January 2003, 82.

² Joint Publication (JP) 3-60, *Joint Doctrine for Targeting*, 17 January 2002, C-7.

³ JP 3-0, *Doctrine for Joint Operations*, 10 September 2001, IV-17.

⁴ JP 3-0, IV-17.

⁵ JP 3-0, GL-6.

⁶ JP 3-60, GL-8. This definition is approved for inclusion in the next edition of JP 1-02.

Notes

⁷ Maj Mark G. Sopko, "Combat Assessment: Analyzing the Results of an Air Campaign," *Air & Space Power Chronicles*, 15 November 1999, n.p., on-line, Internet, 12 February 2003, available from <http://www.airpower.maxwell.af.mil/airchronicles/cc/sopko.html>.

⁸ JP 3-60, GL-9. This definition is approved for inclusion in the next edition of JP 1-02.

⁹ JP 3-60, II-8.

¹⁰ JP 3-09, *Doctrine for Joint Fire Support*, 12 May 1998, I-5.

¹¹ JP 3-56.1, *Command and Control for Joint Air Operations*, 14 November 1994, II-3, IV-5, 11.

¹² JP 3-60, III-5.

¹³ JP 3-60, II-8-9, C-6. JP 3-60 adds a relevant note of caution for assessment: "Simply attacking targets on the [Joint Integrated Prioritized Target List] does not represent the total effectiveness of the operations" (II-9).

¹⁴ JP 3-0, IV-7, GL-5. JP 3-56.1, IV-11. JP 3-60, C-9; GL-4, 8-9. The documents describe the key role of intelligence personnel in CA tasks, but make the J-3 responsible without describing the staff relationships to make it happen. JP 3-60 recommends that the JFC establish a Joint CA Cell under the J-3. Under JP 3-60's CA umbrella, BDA is primarily a J-2 responsibility with input and coordination by the operators. MEA is primarily a J-3 responsibility supported by the intelligence community, while RR is a combined J-3/J-2 function.

¹⁵ JP 3-56.1, II-3, IV-11.

¹⁶ JP 3-60, II-8, III-1, 6-8.

¹⁷ While it may be hard to believe that this is really an issue, it did surface during Operation Enduring Freedom in the fall of 2001. Although the JFACC's staff had begun assessing the overall air effort at the beginning of the operation, CENTCOM directed that all such activities be stopped in November 2001. CENTCOM did not want independent assessments of the campaign's progress to come out of the components. Maj Jack Murray, 9 AF/DOXP, interviewed by author, 20 January 2002.

¹⁸ Lt Col Lewis Hill, HQ ACC/INX, personal communication, 14 February 2003. The inclusion of operational-level assessment is debatable, however. While these targeting publications discuss targeting to achieve systemic effects, they don't describe much about how to accomplish this. Instead, page after page and entire chapters focus on destroying targets, describing target damage mechanisms, probability of damage calculations, and weaponeering to achieve desired levels of damage. BGen David A. Deptula, *Effects Based Operations: Change in the Nature of Warfare* (Arlington, VA: Aerospace Education Foundation, 2001), 11.

¹⁹ Air Force Doctrine Document (AFDD) 2-5.2, *Intelligence, Surveillance, and Reconnaissance Operations*, 21 April 1999, 46.

²⁰ Sopko.

²¹ Air Force Instruction (AFI) 14-117, *Air Force Targeting*, 1 July 1998, 8. "OCA, INT, SA" acronyms expanded.

²² Air Force Pamphlet (AFPAM) 14-210, *USAF Intelligence Targeting Guide*, 1 February 1998, 70.

²³ AFPAM 14-210, 72-73.

²⁴ AFPAM 14-210, 69, 74-76.

²⁵ AFDD 2-5.1, *Electronic Warfare*, 5 November 2002, 19.

Notes

²⁶ AFDD 2, *Organization and Employment of Aerospace Power*, 17 February 2000, 72-73. Emphasis added.

²⁷ AFDD 2-1, *Air Warfare*, 22 January 2000, 107-8.

²⁸ AFDD 2-1.2, *Strategic Attack*, 20 May 1998, 17.

²⁹ Draft AFDD 2-1.2, *Strategic Attack*, 1 January 2000, 23-24, on-line, Internet, available from <https://www.doctrine.af.mil/Library/Doctrine/afdd2-1-2draft.pdf>.

³⁰ AFDD 2-1.3, *Counterland*, 27 August 1999, 78.

³¹ AFDD 2-1.3, 79-80. Emphasis in original. AFDD 2-1.3 also states that another key part of counterland OA is to “maintain a long-term evaluation of the enemy’s efforts to repair or circumvent the damage and disruption caused by friendly counterland operations,” reminiscent of the assessment efforts in WWII’s Operation Strangle in Italy and Vietnam’s Rolling Thunder interdiction operations.

³² AFOTTP 2-3.3, 36.

³³ AFDCH 10-01, 33.

³⁴ AFDCH 10-01, 83.

³⁵ AFDCH 10-01, 33, 83. AF doctrine solidly supports assessment of air operations as a JFACC task, as well. AFDD 2, 56.

³⁶ AFI 13-1AOCV3, *Operational Procedures—Aerospace Operation Center*, 1 July 2002, 23-25, 65.

³⁷ Air Force Operational Tactics, Techniques, and Procedures (AFOTTP) 2-3.2, *Air and Space Operations Center*, 25 October 2002, 32. Both AFI 13-1AOCV3 and AFOTTP 2-3.2 describe the information linkages feed the OA process beyond CA, including Combat Reports and other elements of the Combat Operations Division, the Information Warfare Flight, and elsewhere in the JAOC.

³⁸ AFOTTP 2-3.2, 4.

³⁹ This “split” approach, with CA in ISR and OA in Strategy, has been put in place at the Seventh Air Force CAOC in South Korea. The greatest concern is the “seam” between the ISR and Strategy Divisions—what if the target-based assessment from the Chief of ISR disagrees with the objective-based assessment from the Chief of Strategy? Seventh Air Force recognizes the danger of personality-driven difficulties across the “seam.” Maj John Donahue, 607 CPS/DOX, personal communication, 26 February 2003. The C2 Technical Innovation Group at Hurlburt Field, FL, sponsored a study led by Lt Gen(ret) Hurd that examined standardizing the ISR Division across all JAOCs. One of their recommendations is to put the “split” assessment approach explicitly into AF doctrine and guidance. Lt Gen Hurd, retired, and Lt Col Dash Jamieson, “AOC ISR Project: Standardizing the ISR Division,” briefing slides, December 2002, 30. This approach is being considered for the new AFDD 2-1.9, *Targeting*, currently under development. Maj Hugh Curry, AFDC/DD, interview by author, 6 February 2003.

⁴⁰ AFDD 2-6.2, *Air Refueling*, 19 July 99, 39-40.

⁴¹ Senior USTRANSCOM official, lecture, Air Command and Staff College, 14 March 2003. Anonymous in accordance with Air Command and Staff College’s non-attribution policy.

⁴² Roger G. Miller, “Freedom’s Eagles: The Berlin Airlift, 1948-1949,” *Air Power History*, vol. 45, no. 3 (Fall 1998), 18-19.

Chapter 3

Operational Assessment as Part of the JFACC's OODA Loop

The beginning of wisdom is calling things by their right names.

—Confucius

Our combat assessment cycle time needs to be improved. The feedback time of combat results needs to be shortened. In other words, we need a faster flow of key war-fighting results to the JFACC.

—Lt Gen Steve Croker, 8 AF/CC

In 40 hours I shall be in battle, with little information, and on the spur of the moment will have to make most momentous decisions. But I believe that one's spirit enlarges with responsibility and that, with God's help, I shall make them and make them right.

—Gen George Patton

The confusion in doctrine and guidance about providing feedback on air operations, so critical for successful EBO, significantly hampers the effectiveness and agility of American warfighting by increasing friction across organizational seams in the JAOC and between the JAOC and JFC staff. Rather than continuing the tail chasing about definitions, roles, and responsibilities, this paper goes back to first principles and focuses on what assessment is supposed to do for the JFACC.

It's not about targets. It's not even about effects. It's about *command*.

The JFACC as an Operational Commander

As previously described, the JFACC is more than the air subordinate of the JFC. He is a commander in his own right, with an area of operations that stretches across the entire AOR. His JAOC may operate at the tactical level, controlling aspects of the minute-by-minute, hour-by-hour air operations in the Combat Operations Division, but the aspect that concerns us here is the JFACC's role at the operational level of war. He must have the ability to adapt his plans to fit the evolving and uncertain reality of war and exploit opportunities for victory as they are found.

As a commander, the JFACC will have to make decisions in a time-compressed environment—"Time pervades all decision making in war."¹ He will rarely have the luxury to wait for the best information to accumulate before making those decisions, as the epigraph from Gen Patton on the previous page suggests. Time's dominance in JFACC decision-making is best explained by the warfighting theory of Col John Boyd.

Boyd and the OODA Loop

After his retirement from the Air Force in 1975,² Col John Boyd expanded his concepts of air-to-air energy maneuverability tactics into a rich theory of warfighting that emphasizes the psychological and temporal aspects of war. While much of his work concentrates on achieving victory through operating at a faster tempo than the adversary by quickly adapting to changing situations while maximizing and exploiting friction in the adversary's C2 processes,³ it is his elegant description of the decision-making cycle that concerns us here.

Boyd contends that all rational human behavior, individual or organizational, can be explained as continual cycling through four distinct tasks: Observation, Orientation, Decision, and Action. He refers to this cycle as the "OODA Loop"⁴ (see Figure 11). Observation detects events within an individual's or group's environment, allowing the perception of change or the

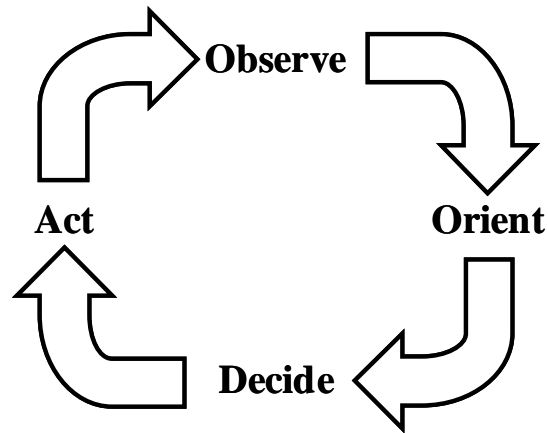


Figure 11, Simple OODA Loop

lack thereof. Orientation develops context and extracts meaning from the events detected during Observation and is the centerpiece of understanding the way people act. Decision is the cognitive comparison of courses of action while Action is simply the resulting behavior.⁵

Figure 12 shows the full OODA loop from the last slides of Col Boyd’s briefing, “The Essence of Winning and Losing.” The most important additions include the complexity of the process of Orientation, the feedback from Decision and Action to Observation, and the implicit guidance and control flowing from Orientation. Advantages in Observation and Orientation enable a tempo in decision-making and execution that outpaces the adversary’s ability to react effectively in time.⁶ The most important phase of the loop is orientation.⁷

Speed and precision in the OODA loop is important in time-critical non-combat situations as well. The absence of an adversary does not make the mission less important or the operating environment less hostile. Fast problem solving and decision making outside of combat can also be described by Col Boyd’s C2 process.

Assessment and the JFACC’s OODA Loop

Since the OODA loop concept is applicable to behavior at the operational and strategic

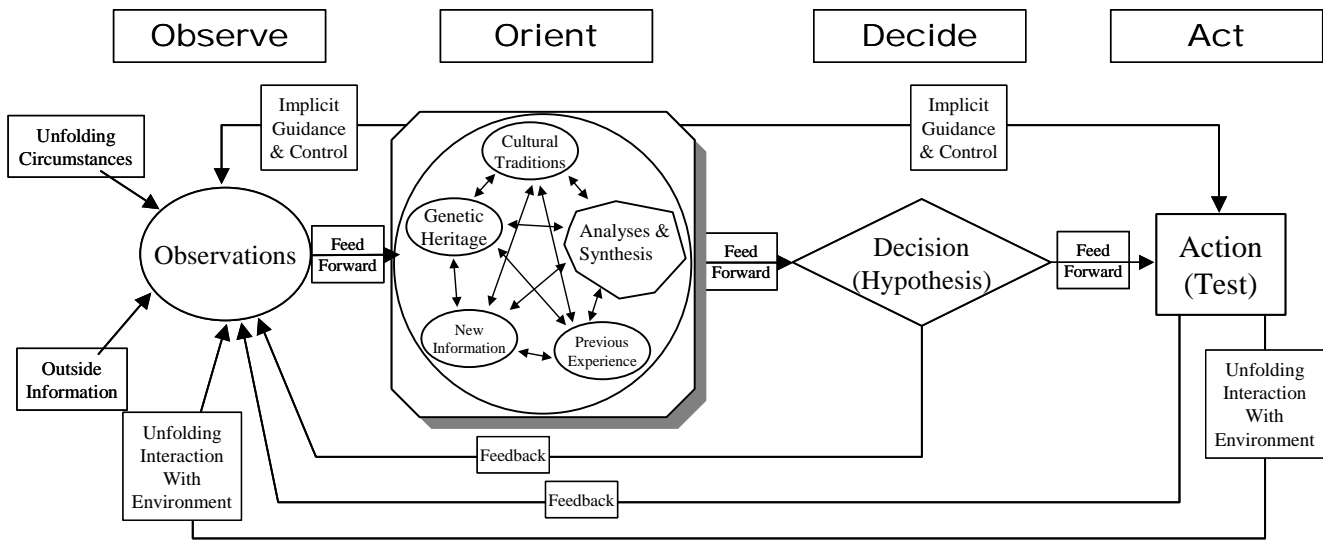


Figure 12, Full OODA Loop⁸

levels of war,⁹ it can serve as a model for JFACC decision-making. The JFACC will have to command his forces with uncertain and incomplete understanding—the quality of the information he *does* possess, that forms his picture of the air effort (orientation) and how it is changing (observation), is critical. As Gen Horner recently put it, “Knowledge based on rapid and accurate situational awareness and understanding is the fundamental requirement for effects based planning and operations.”¹⁰ But theater-wide air and space operations are too complex and detailed to quickly and accurately digest without help, and this is where assessment comes in.

It is easy to see assessment’s role in the OODA loop paradigm. *The fundamental purpose of air assessment at the operational level is to feed the JFACC’s Observation and Orientation to improve the speed and accuracy of his decision-making.* Assessment assists the JFACC’s Observation by looking for changes and highlighting trends in the results of air and space operations, while keeping the JFACC’s critically important Orientation accurate through monitoring the status of friendly and enemy forces and friendly progress toward planned objectives. Because the JFACC is making decisions across the whole spectrum of operations, the information delivered by the assessment function must also extend across the spectrum of

operations. Assessment provides part of the feedback loops seen in Figure 12 as part of the regular JAOC battle rhythm.¹¹

The focus on the JFACC's OODA loop highlights an important characteristic of the assessment function—it is not part of the decision, nor are the assessors decision-makers. A detached perspective allows an objective evaluation of the data streaming through the JAOC, the better to judge relevance, consider hypotheses, and communicate the inherent uncertainty of inferences made in the fog and friction of war.¹²

Operational Assessment Mission Statement

With Col Boyd's decision-making model in mind, operational-level assessment at the air component can be viewed as building and interpreting a mosaic of relevant, actionable information out of the inaccurate, missing, and late data pouring into the JAOC to improve the JFACC's situational awareness and decision-making. It is a formal staff function to assemble and evaluate evidence about the effects being achieved, build the case for or against achieving operational objectives, and measure the Joint air effort's progress toward accomplishing the JFACC's constantly updated plans. Quantitative evaluations are preferred for their objectivity, but the nature of war makes subjective judgement necessary as well. Evidence and reasoned conclusions flow up the chain to the JFC's staff to inform their decision-making as well.

This approach is far more comprehensive than found in Joint doctrine's CA. Although all targeting process or air tasking order cycle diagrams put an assessment phase at the end (like Figure 3), assessment planning and the actual assessment of effects must be integral to the entire JAOC process if EBO is to be fully successful.¹³ Integrating the massive flow of data into the JAOC on both friendly and enemy situations requires careful preparation and trained personnel.¹⁴ This groundwork pays off by enabling a faster, more accurate OODA loop for the JFACC.

Notes

¹ Robert R. Leonhard, *Fighting By Minutes: Time and the Art of War* (Westpoint, CT: Praeger, 1994), 3.

² Robert Corum, *Boyd: The Fighter Pilot Who Changed the Art of War* (New York, NY: Little, Brown, and Company, 2002), 312.

³ Maj David S. Fadok, *John Boyd and John Warden: Air Power's Quest for Strategic Paralysis* (Maxwell AFB, AL: Air University Press, February 1995), 13-16.

⁴ Fadok, 16.

⁵ Michael T. Plehn, "Control Warfare: Inside the OODA Loop," (Master's thesis, School of Advanced Airpower Studies, June 2000), 14, 24, 26.

⁶ Colin Gray, *Modern Strategy* (Oxford, UK: Oxford University Press, 1999), 91.

⁷ "Orientation is the *schwerpunkt*." John R. Boyd, "Organic Design for Command and Control," briefing slides, May 1987, 16.

⁸ John R. Boyd, "The Essence of Winning and Losing," briefing slides, 28 June 1995, 4.

⁹ Gray, 91.

¹⁰ Gen Charles A. Horner, retired, "Men and Machines in Modern Warfare," Norway, 2003, 2.

¹¹ Air Force Operational Tactics, Techniques, and Procedures (AFOTTP) 2-3.2, *Air and Space Operations Center*, 25 October 2002, 8, 35-36.

¹² This allows the operational assessment team to fulfill the role that Martin Van Creveld called "the directed telescope," an important C2 capability that a commander can use at will to gain information directly about the enemy's forces, terrain, or own forces outside of normal reporting channels, tailored to meet his momentary, specific requirements. By seeking the information that the commander needs when he needs it, this function keeps the subordinate units from having to report on everything all the time, saving enormous amounts of work. At the same time, by cutting through the repeated summarization of information as reports flow up the chain of command, the "directed telescope" helps assure both timely and accurate information for the commander. In the absence of such a function, the headquarters is in danger of becoming a prisoner of its own reporting system. Martin van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), 75, 272-273.

¹³ Col Edward Mann, Lt Col Gary Endersby, and Tom Searle, "Dominant Effects: Effects-Based Joint Operations," *Aerospace Power Journal*, Fall 2001, 97.

¹⁴ Maj T. W. Beagle, Jr., *Effects-Based Targeting: Another Empty Promise?*, (Maxwell AFB, AL: Air University Press, December 2001), 92.

Chapter 4

What To Assess

The principle task for the general is mental, involving large projects and major arrangements. But since the best dispositions become useless if they are not executed, it is essential that the general should be industrious in seeing whether his orders are executed or not.

—Frederick the Great

How can any man say what he should do himself if he is ignorant what his enemy is about?

—Baron Antoine-Henri Jomini

The first three chapters of this paper have established what operational-level assessment must accomplish in assisting JFACC decision-making through improving situational awareness and actionable knowledge. This JAOC function is inherent in the JFACC's C2 of air operations and is part of what Gen Jumper means when he writes, "We are aiming for a forensic-level understanding of the battle space in all four dimensions."¹ But if assessment's role in EBO is providing feedback on achieving desired effects, what should be measured?

Joint and AF guidance emphasize measuring changes in target status, but this is insufficient to meet JFACC needs. Instead, Col John Boyd's decision making model can assist here as well, starting with a picture of combat as two interlocking OODA loops, one Blue and the other Red, connected by mutual interaction in the combat environment. Figure 13 depicts this graphically. Each side has its own set of observations, orientation, decisions, and actions. Orientation and Decision occur within a side's control, while Observation brings data back from the outside

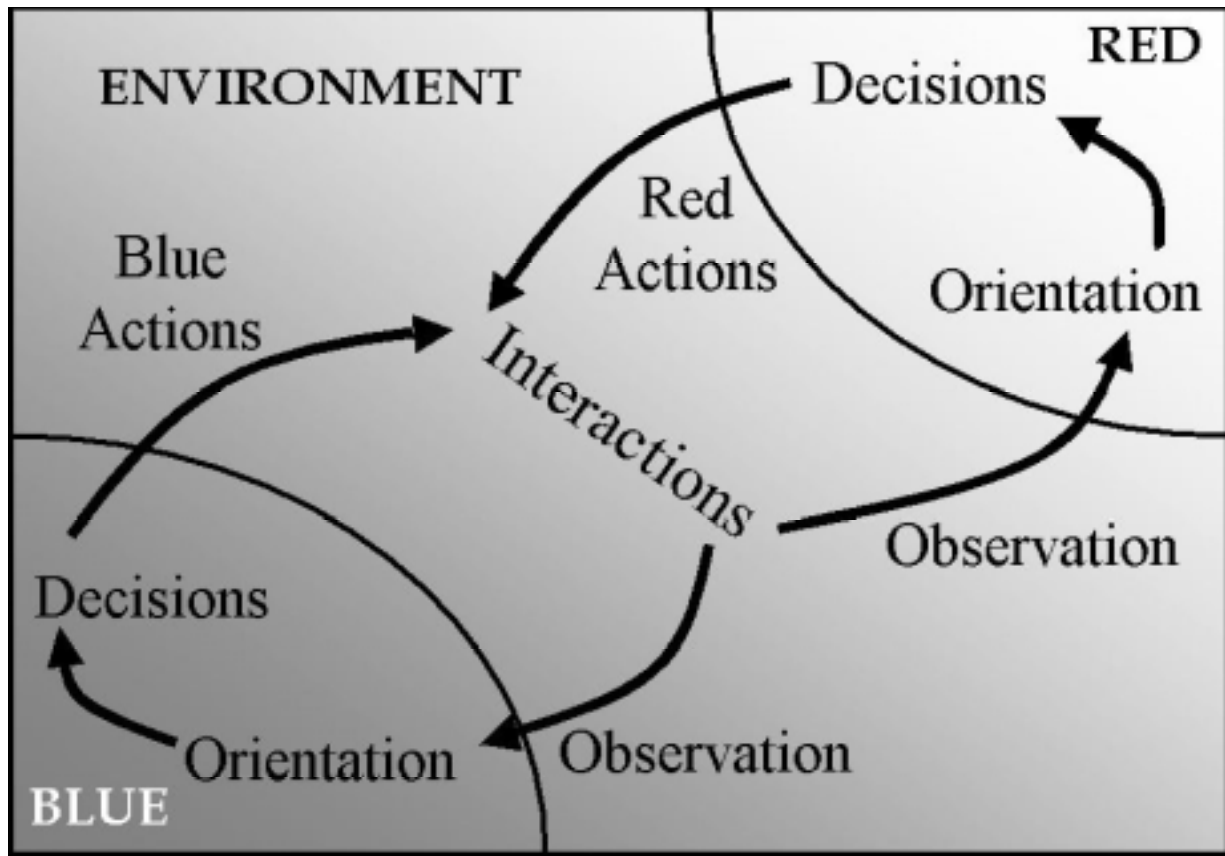


Figure 13, Interacting OODA Loops

environment.

Actions take place out in the environment, where they affect and are affected by each other in an interplay of measure and countermeasure that is also influenced by the environment itself. An example of this interaction at the tactical level is a Blue fighter on a mission to suppress enemy air defenses, hunting and being hunted by a Red SAM system trying to shoot down Blue aircraft, in an overcast sky over mountains obscuring line of sight for both. Taken to the operational level, a similar example is a larger fight for air superiority over Red's territory by a Blue force of fighters, bombers, and ISR aircraft facing off against Red's Integrated Air Defense System (IADS) of fighters, SAMs, anti-aircraft artillery, radars, and airfields, with weather influencing the efforts of both sides. Both observe the outcome of the interactions, trying to

make sense of what is seen through the fog and friction of conflict to build the Orientation needed for fast, accurate decision making.

These interlocking OODA loops frame the general categories of information the operational assessment function must capture to provide a complete picture for JFACC situational awareness (i.e. Orientation) and guide the selection of measures of effectiveness (MoEs). The JFACC has to know the present capabilities of his forces and the actions they are currently carrying out (measures of *effort*), the immediate results of those actions and their interaction with enemy efforts and the environment (measures of *interaction*), and the emerging consequences of those results on the enemy's capabilities and decisions (measures of *effect*).²

Effort—Planned and Actual

The first category of assessment information, that of one's own side's efforts to create effects in the combat environment, is easiest and fastest to observe, since those efforts are entirely within the Blue span of control. This is monitoring the "Blue Actions" in Figure 13. The JFACC must understand how the JAOC and his air forces are carrying out his plan. Are the JFC's apportionment and JFACC's allocation of air and space assets being accurately executed? Was the Air Tasking Order (ATO) flown as tasked? Knowing Blue's present status is also critical for the JFACC to gauge the near- and long-term potential of his forces to create his desired effects. The disposition of friendly forces, bases, and supplies directly translates into the readiness of the joint air component and can be a significant restraint on air operations.³ Because of the difficulties and delays involved with assessing battlefield results, the status of Blue efforts may be the only thing available for the JFACC to base decisions on.⁴

Measuring effort in this fashion is not part of the "combat assessment" found in Joint or targeteer guidance discussed in Chapter 2. This is a significant defect. The JFACC needs this

feedback to overcome developing problems early, quickly, and with the least effort. If this kind of information is ignored by the JAOC's formal assessment system, the absence of a single integrated source of critically important force disposition information will lead to ad hoc attempts to fill the JFACC's needs. Inaccurate and undisciplined information processes will amplify fog and friction in the JAOC, contributing to incorrect perceptions about the air component's ability to create operational effects and clouding the JFACC's orientation.

Formal feedback on Blue status should include combat support as well as combat efforts. There must be a feedback loop comparing planned to actual operations to allow reconfiguring combat support plans and infrastructure to meet the dynamic requirements of contingency operations. In this fashion, combat support can be tailored and strategically employed to enable the desired operational effects.⁵

Unfortunately, suggestions that friendly status and force disposition information is part of assessment meet with significant criticism from some quarters,⁶ in part flowing from popular ideas about Vietnam. One of most prevalent myths about Rolling Thunder is that sortie and bomb tonnage counts were significant MoEs used to judge the effectiveness of the interdiction effort. While the number of sorties flown was one of the simplest and most widely used statistics collected, hardly anyone in higher headquarters contended that these numbers revealed anything about Rolling Thunder's effectiveness. Air Force commanders clearly distinguished between these statistics and effectiveness claims, regarding the sortie counts as administrative encumbrances used by the civilians in the Johnson administration as a way to closely control the level of effort against North Vietnam as part of their on-going strategic policy.⁷

The cautions about Rolling Thunder are worth remembering, however. While monitoring level of effort and force status is important for the JFACC, it is also important to understand that

measuring effort does not translate into measuring effectiveness. Tracking the numbers of leaflets dropped from the air, for example, doesn't tell you if any were read by the enemy, never mind how many soldiers decided to surrender.

Interaction With the Enemy and the Environment

This category of assessment, measuring the immediate results of combat operations (the “Interactions” in Figure 13), falls most in line with the assessment themes described in Chapter 2. At the operational level, the JFACC needs to understand how the conflicts between Red and Blue actions are shaping up. Understanding the outcome of Blue and Red's interactions in the combat environment builds on the tactical, target-focused methods of Joint CA that assess the immediate results of contact with the enemy. But because these interactions happen outside Blue's span of control, feedback is inherently delayed by the time required to process that tactical data. Fog and friction play a larger role here than in assessing Blue efforts. Assessing interactions is more important but harder to do.

The most challenging operational assessments in this category are about the sustained struggles between the two opponents, such as the fight for air superiority in the Battle of Britain or the long interdiction campaign in Vietnam called Rolling Thunder.⁸ Here each operational commander faces successive OODA loops of measure and countermeasure, where ultimate victory depends on correctly interpreting the unfolding events and adjusting strategies and tactics based on the feedback produced by the assessment function.

Effects—Enemy Behavior

The third category of operational assessments gets right to EBO's ultimate objective, of compelling enemy decision makers to do our will.⁹ This demands more than what is typically

considered to be CA or OA. Assessment must provide the commander with more information than just the physical and functional results of weapons employment. It has to search for evidence that the chosen means are creating the desired ends within the enemy's span of control.

In many cases, the desired effect will be reducing enemy capabilities, denying the enemy the ability to Act (see Figure 13). Assessing the current status and capabilities of enemy units is more an art than a science.¹⁰ Only the adversary, whose analysis may include a different set of variables, knows the real effect of an attack. Fog and friction will also obscure observation and degrade the accuracy of assessments.¹¹

But the definitive goal of EBO is not assessing the enemy's remaining capabilities—it is his intentions, the combination of his decision-making values of his Orientation and the feasible options for his Decision, that the operational commander ultimately wants to know. Is the enemy leadership being compelled to behave more in line with Blue strategic interests?¹² But determining an adversary's true intentions is fiendishly difficult. Assessing capabilities is much easier and is sometimes all one can get.¹³ In either case, these effects are far removed from Blue's span of control and are likely to be indirectly connected to Blue action. This makes observing and interpreting measures of effect slower and more uncertain than measuring effort or direct outcomes of interaction.

Given the importance of imposing effects on the enemy in EBO, *the ultimate key to operational-level assessment is observing and comprehending enemy behavior*. "Significant continuous observation of the enemy will be required so that combat plans and operations can be altered to maintain the enemy on a course that will attain the desired effects."¹⁴ Commanders need assessment of both systemic and psychological effects. This represents perhaps the most difficult challenge to EBO and will require great effort over many years to deal with many

Air Component Assessment Sources for Measuring...

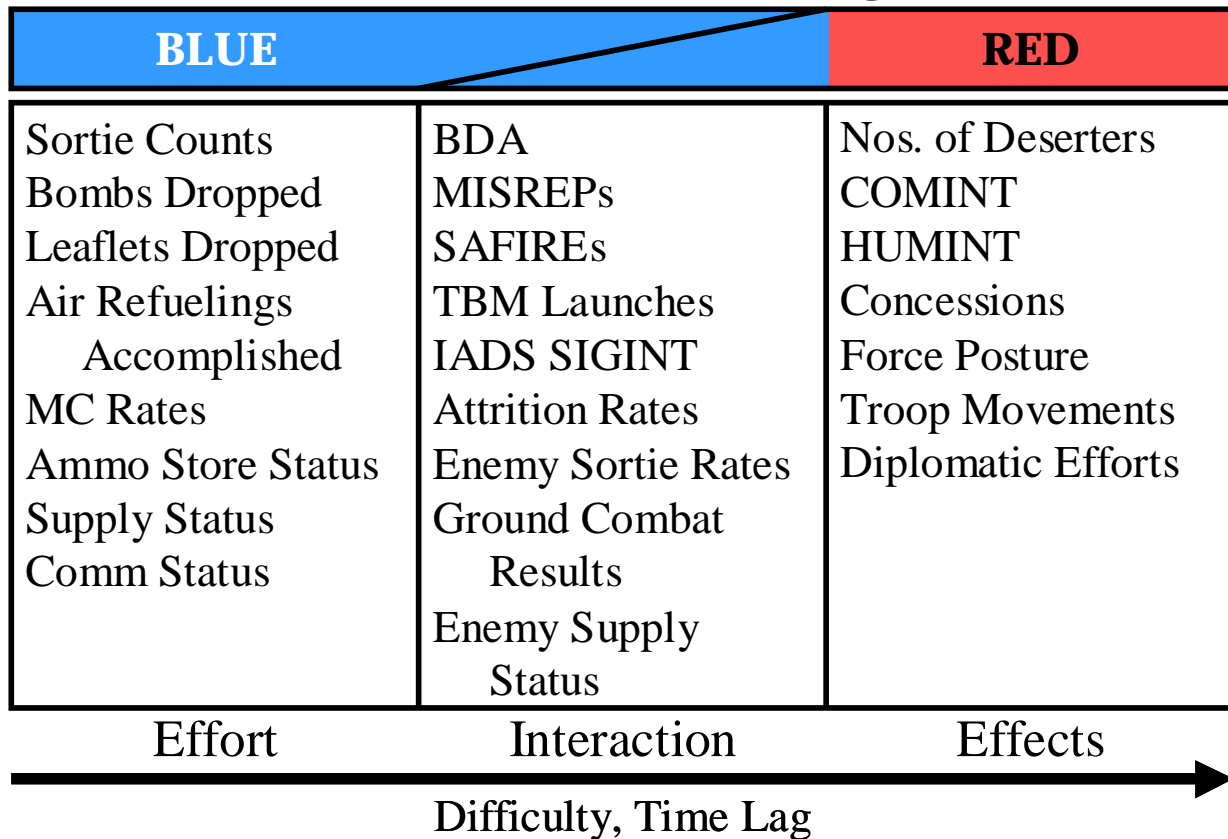


Figure 14, Data for Comprehensive Operational Assessment

complex issues.¹⁵

Summary

The JFACC needs a complete picture laid out for him to assist in his time critical decision-making, starting with the disposition of his forces and the efforts made by them attempting to carry out his plans (Blue Action from Figure 13), including the interaction of those efforts with the environment and the enemy's own efforts (interactions of Red and Blue Actions within the environment), and ultimately comprehending the actions, capabilities, and decisions the enemy makes in response (Red Actions, Orientation, and Decision). Figure 14 sketches out the wide-

ranging spectrum of data needed to fuel this total assessment picture.

The thorough and inclusive approach to operational-level assessment inspired by Col Boyd's OODA loop goes far beyond the assessment themes found in Joint and AF publications. But the JFACC's information needs are clear—EBO demands a much wider knowledge base for the operational commander, and the assessment function must provide it.

Notes

¹ Gen John P. Jumper, "Global Strike Task Force: A Transforming Concept, Forged By Experience," *Aerospace Power Journal*, Spring 2001, 30.

² Assessment needs in non-combat contingencies, such as humanitarian or other mobility-centric operations, can be similarly broken down using just one OODA loop. Actions interact only with the environment. Here only measures of "effort" and "interaction" matter, since there is no opponent whose decisions are being affected.

³ For example, the status of Task Force Hawk's training and equipment during Operation Allied Force played a role in the operational-level decision not to use the AH-64s in combat. Benjamin S. Lambeth, *NATO's Air War for Kosovo: A Strategic and Operational Assessment*, RAND Report MR-1365 (Santa Monica CA: RAND, 2001), 155-156.

⁴ Desert Storm is a prominent example, where the objective was to drop Iraqi army division effectiveness by 50% in order to prepare the battlefield for coalition ground forces. Because Gen Schwarzkopf's components were unable to agree on how to measure that effectiveness, he was more inclined to use the cumulative number of air strikes against the divisions as his prime MoE rather than the damage reported from the strikes. Maj T. W. Beagle, Jr., *Effects-Based Targeting: Another Empty Promise?* (Maxwell AFB, AL: Air University Press, December 2001), 90. Although this story is often told, some disagree that Gen Schwarzkopf used any numerical measure at all and that he decided to start the ground invasion solely based on his subjective judgement. Lt Gen Horner, the JFACC, instead used the sortie counts to assess progress. Lt Col Lewis D. Hill, HQ ACC/INX, personal communication, 14 February 2003.

⁵ Maj Gen Terry L. Gabreski, James A. Leftwich, Col Robert Tripp, retired, Dr. C. Robert Roll, Jr., and Maj Cauley von Hoffman, "Command and Control Doctrine for Combat Support: Strategic- and Operational-Level Concepts for Supporting the Air and Space Expeditionary Force," *Air & Space Power Journal*, Spring 2003, 116-117. This article strongly advocates using operationally relevant MoEs for combat/operational assessment of combat support.

⁶ Lt Col Lewis D. Hill, personal communication, 14 February 2003. When discussed with a different senior USAF targeteer, his comment was tracking measures of Blue effort such as sorties counts, aircraft mission-capable rates, bomb tonnage expended, etc. was useful only for interservice bickering, public affairs releases, and "justifying Bronze Stars" for USAF generals.

⁷ The civilians in the Johnson administration viewed the intensity of air operations over North Vietnam as a way to put political pressure on the North Vietnamese government, and so regulated the allowed number of sorties closely to ensure their current desires were being met. Paul Darien Berg, "Assessing U.S. Air Force Bombing Effectiveness During Rolling Thunder" (PhD diss., Auburn University, 6 August 2001), 7-8, 201-2, 206-208, 211.

Notes

⁸ The struggle for air superiority, almost always an early US objective in any conflict, is particularly difficult to assess because the goal, freedom of action, is intangible. It rests on the outcome of the interaction between friendly and enemy efforts to control the battlespace. The operational-level assessment question becomes how to measure incremental changes in “freedom of action.” In sustained contests for air superiority, such as in WWII or Vietnam, this could be done by comparing enemy effort (interceptor sorties, SAM launches, anti-aircraft artillery firings) over time to the results of combat (friendly losses). Trends in friendly attrition per enemy sortie or missile shot tells the JFACC about his progress toward air superiority—when the friendly loss rate becomes very low, the enemy can no longer actively interfere in friendly air operations. Likewise, when the enemy’s sortie or SAM launch rate drops, evidence accumulates that the enemy is losing the ability to conduct their own air operations. Maj James M. Holmes, *The Counterair Companion: A Short Guide to Air Superiority for Joint Force Commanders* (Maxwell AFB, AL: Air University Press, April 1995), 31. If the enemy’s air defense reactions drop in certain areas, “rolled back” by offensive counterair efforts, the airspace in which the JFACC is willing to risk his forces may also expand. “Freedom of action” could be measured by the degree that the JFACC permits different types of aircraft to fly in important sectors of airspace.

⁹ Beagle, 5. One can argue that total war has a different objective than coercion, but unconditional surrender still requires a decision by a nation’s leaders to end resistance. For example, the Japanese surrender in August 1945 was the outcome of a political process that started in late July and included a deadlocked cabinet and an attempted coup. It came down to one man’s decision—Emperor Hirohito’s. Thomas B. Allen and Norman Polmar, “The Voice of the Crane,” *Military History Quarterly*, vol. 7, no. 3 (Spring 1995), 98-102. This single decision saved what the War Department estimated to be over 190,000 American and uncounted Japanese casualties. Peter Maslowski, “Truman, the Bomb, and the Numbers Game,” *Military History Quarterly*, vol. 7, no. 3 (Spring 1995), 107.

¹⁰ BGen Vincent Brooks, CENTCOM Operation Iraqi Freedom press conference, Doha, Qatar, 3 April 2003.

¹¹ Draft AFDD 2-1.2, *Strategic Attack*, 1 January 2000, 9, on-line, Internet, available from <https://www.doctrine.af.mil/Library/Doctrine/afdd2-1-2draft.pdf>.

¹² BGen David A. Deptula, *Effects Based Operations: Change in the Nature of Warfare* (Arlington, VA: Aerospace Education Foundation, 2001), 26.

¹³ Col John Hughes-Wilson, *Military Intelligence Blunders* (New York, NY: Carroll and Graf Publishers, 1999), 5-7.

¹⁴ Gen Charles A. Horner, retired, “Men and Machines in Modern Warfare,” Norway, 2003, 2.

¹⁵ Col Edward Mann, Lt Col Gary Endersby, and Tom Searle, “Dominant Effects: Effects-Based Joint Operations,” *Aerospace Power Journal*, Fall 2001, 98. The need to observe and comprehend enemy behavior will require assessors who understand the enemy’s culture and can interpret the indicators given off by a foreign government under serious stress by American attack. Subjective assessment of “soft factors” may be the most important contribution of the OA team to JFACC decision-making. OA team membership should therefore include people with the background to make informed assessment of “soft factors,” such as pol-mil intelligence analysts, historians, and Foreign Area Officers.

Chapter 5

Conclusion

The central problem is not collecting and transmitting information, but synthesizing for the decision maker.

—Richard Burt

War is the most complex of human endeavors. There are more variables involved than you can imagine.

—MGen Robert Scales, US Army (retired)

EBO is an ambitious and challenging approach to military action, requiring many changes to the current Joint and interagency processes that govern US warfighting.¹ Applying EBO at the air component level drastically increases the scope, accuracy, and timeliness demanded of the air assessment function.

Treatment of assessment in Joint and AF publications is woefully inadequate to guide the men and women responsible for organizing, training, and equipping this function in tomorrow's JAOCs.² Without well-publicized doctrine that clearly articulates what airpower intends to achieve and how it will assess those achievements, JFACCs and untrained JAOC personnel will continue to rely on inadequate ad hoc procedures and many operational and strategic decisions will continue to be based on hope rather than analysis.³

The solution is clear, coherent guidance that explains what assessment must accomplish. Col John Boyd's theory of warfare and his "OODA loop" decision-making model provide the harmonizing foundation for revising present doctrine, focusing on assessment's role in assisting

JFACC observation and orientation on the complex and fast-moving air and space operations under his command.

The first step in revising assessment guidance should be for AF doctrine to formally adopt the “tactical, target-focused CA by the ISR Division; operational, effects-focused OA by the Strategy Division” split pioneered by Seventh Air Force. The narrow interpretation of CA should be preserved in Joint doctrine, while Joint guidance should adopt OA to describe the operational-level assessment found in the broad CA interpretations in JP 3-0 and JP 3-60. The JFC’s assessment, wrapping up OA from all components and concerning the entire campaign, should then appropriately be called “campaign assessment.”⁴ Finally, Joint doctrine should be revised to clearly describe the assessment responsibilities of the JFC, JFACC, and other component commanders, allowing the components to conduct the assessments appropriate for their responsibilities.

Finally, while higher-level doctrine is being revised, tactics, techniques, and procedures should be developed for operational-level assessment to increase the speed and accuracy of JFACC decision-making, emphasizing comprehensive, fast feedback on friendly efforts, their interactions with the enemy and the environment, and their effects on enemy behavior. The existing paradigm of only measuring the results of combat must expand to include the status of our forces together with the actions and decisions of the enemy. Combat support, such as air refueling and other air mobility missions, must also be tied into the comprehensive assessment process.⁵

Doctrine communicates what we believe is the best way to conduct military affairs.⁶ Feedback on military operations is a fundamental part of C2, yet our incoherent guidance suggests we don’t know the “best way” to accomplish it. Without good doctrine to point the way

forward, efforts to organize, train, and equip the air assessment function are doomed to failure. If the Air Force is serious about EBO, it must recognize the importance of a comprehensive assessment function and build the doctrinal foundation needed to prepare the way for success.

Notes

¹ Col Edward C. Mann III, retired, Lt Col Gary Endersby, retired, and Thomas R. Searle, *Thinking Effects: Effects-Based Methodology for Joint Operations*, CADRE Paper 15 (Maxwell AFB, AL: Air University Press, October 2002), 4.

² Mann, et. al., 75.

³ Maj T. W. Beagle, Jr., *Effects-Based Targeting: Another Empty Promise?*, School of Advanced Airpower Studies (Maxwell AFB, AL: Air University Press, Dec 01), 93.

⁴ Lt Gen Hurd, retired, and Lt Col Dash Jamieson, “AOC ISR Project: Standardizing the ISR Division,” briefing slides, December 2002, 24.

⁵ This paper purposefully did not try to separate the assessment function into intelligence and operations pieces, as found in some Joint and AF guidance. One of the fundamental reasons why assessment cannot be called a strictly “intelligence” function is that “intel doesn’t do Blue”—including Blue efforts in the full assessment picture requires going beyond the boundaries of the US intelligence discipline. A comprehensive effort to assess effects, especially on enemy behavior, requires a multi-disciplinary effort by operators, targeteers, other intelligence analysts, historians, Foreign Area Officers, and operations research analysts to sift through the flow of JAOC data and wring out relevant evidence for the JFACC. It is an immense task that demands top quality talent with many different viewpoints to understand the conflict from both Blue and Red perspectives, despite the fog and friction of war. The organization of such a team, including reachback vs. in-theater assets, is beyond the scope of this paper, but assessment of operational effects can’t occur in a vacuum or a stovepipe.

⁶ Col Dennis M. Drew and Dr. Donald M. Snow, *Making Strategy: An Introduction to National Security Processes and Problems* (Maxwell AFB, AL: Air University Press, August 1988), 163.

Appendix A

Summary of Joint and Air Force Guidance On Assessment

The following tables summarize the treatment of assessment in selected Joint and Air Force publications, including the name of the document and date of publication (date of latest release for draft documents). The column “Assessment Responsibility” describes the organization, if any, that the document assigns responsibility for assessment. “Mention of CA/OA” describes how, if at all, the document refers to combat assessment and operational assessment as described in Chapter 2. A brief summary of how the document addresses assessment occurs in the “Notes” column.

Table 1, Summary of Joint Assessment Guidance

Publication	Date	Assessment Responsibility	Mention of CA	Mention of OA	Notes
JP 1-02, DOD Dictionary of Military and Associated Terms	9 Jan 03		Defines		CA = BDA+MEA+RR
JP 2-0, Intelligence Support to Joint Operations	9 Mar 00				CA not mentioned
JP 2-01, Joint Intelligence Support to Military Operations	20 Nov 96	J-3, w/ input from J-2 & components	Defines		JFC is in charge of targeting; BDA is J-2 responsibility; peculiar def. of CA = BDA+MEA+MA
JP 2-01.1, Joint TTP for Intelligence Support to Targeting	9 Jan 03		Defines		CA = BDA+MEA+RR; defines MoE
JP 3-0, Doctrine for Joint Operations	10 Sep 01	J-3	Defines		CA is broadly operational for the JFC; BDA is J-2 responsibility
JP 3-01, Countering Air & Missile Threats	19 Oct 99		Mentions		Assessing attack's effects on enemy capabilities is a planning consideration
JP 3-01.4, Joint TTP for Suppression of Enemy Air Defenses	25 Jul 95				CA not mentioned; component commanders monitor SEAD mission results
JP 3-03, Doctrine for Joint Interdiction Operations	10 Apr 97		Defines		Takes broad interpretation of CA
JP 3-09, Doctrine for Joint Fire Support	12 May 98	J-3	Mentions		J-3 coordinates joint force CA; J-3 also assesses campaign
JP 3-09.3, Joint TTP for Close Air Support	1 Dec 95				Detailed discussion of BDA for CAS
JP 3-17, Joint Doctrine & TTP for Air Mobility Operations	14 Aug 02				CA not mentioned; air mobility to be fully integrated in planning/execution/assessment
JP 3-55, Doctrine For Reconnaissance, Surveillance, and Target Acquisition Support For Joint Operations	14 Apr 93	Intel			Predates CA term; contradictory definitions of BDA, one that could include operational assessment & one that's clearly target status
JP 3-56.1, Command and Control for Joint Air Operations	14 Nov 94	J-3, assisted by J-2	Describes		CA both broad and narrow; JFACC tasked with air ops assessment; JFC & JFACC staffs both tasked to assess efforts
JP 3-60, Joint Doctrine for Targeting	17 Jan 02	JFC CA cell in J-3, assisted by J-2	Defines		Describes critical role of MoEs and JFC objectives; good discussion of both narrow and broad CA
AFTTP(I) 3-2.30, Multiservice Procedures for JAOC and Army Air & Missile Defense Command Coordination	Jan 01	JAOC Strat Div		Calls OA "CA"	Multiservice TTP; describes 4 division JAOC w/ assessment by Strategy Div's "CA Team"; basically AFDD 2's JAOC with "CA" replacing "OA"

Table 2, Summary of AF Assessment Guidance

Publication	Date	Assessment Responsibility	Mention of CA	Mention of OA	Notes
AFDD 1, Air Force Basic Doctrine	14 Nov 94		Mentions		Intel <i>assists</i> in CA thru BDA & MEA
<i>AFDD 1, Air Force Basic Doctrine (DRAFT)</i>	<i>16 Jan 03</i>	Intel	Mentions		Intel <i>provides</i> CA thru BDA & MEA
AFDD 2, Organization and Employment of Aerospace Power	17 Feb 00	Strat Div	Mentions		JFACC to do CA at operational & tactical levels; tasks Strat to do op. level CA
AFDD 2-1, Air Warfare	22 Jan 00	Intel	Describes	Defines	Discusses measures of success at operational & strategic levels
AFDD 2-1.1, Counterair Operations	26 Apr 02		Mentions		CA depends on timely integrated ISR
AFDD 2-1.2, Strategic Attack	20 May 98			Defines	
<i>AFDD 2-1.2, Strategic Attack (DRAFT)</i>	<i>1 Jan 00</i>	Implied intel function		Describes	Continual assessment key to EBO
AFDD 2-1.3, Counterland	27 Aug 99		Defines	Defines	CA is tactical, OA is operational level
AFDD 2-1.5, Nuclear Operations	15 Jul 98	J-3 assisted by J-2	Defines		
AFDD 2-5, Information Operations	4 Jan 02	ISR Div	Mentions		
AFDD 2-5.1, Electronic Warfare	5 Nov 02	EW planners	Mentions	Mentions	Tasks EW planners with EW CA at operational and tactical levels
AFDD 2-5.2, Intelligence, Surveillance, and Reconnaissance Operations	21 Apr 99	ISR personnel	Defines		Peculiar def. of CA = BDA+MEA+MA
AFDD 2-5.3, Psychological Operations	27 Aug 99	Intel			Doesn't mention CA or OA, but does say assessing PSYOPS effects is difficult and requires preparation
<i>AFDD 2-5.3, Psychological Operations and Effects (DRAFT)</i>	<i>30 May 02</i>	Info Warfare Team	Mentions		Says IW Team will evaluate results; doesn't mention difficulty of assessing effects
AFDD 2-6, Air Mobility Operations	25 Jun 99				Air Mobility Division to be fully involved in AOC assess, plan, & execute process
AFDD 2-6.2, Air Refueling	19 Jul 99	Air Refueling Control Team	Mentions		Air Mobility Division to be fully involved in AOC assess, plan, & execute process; assess constrains on & utilization of refueling assets
AFDD 2-6.3, Air Mobility Support	10 Nov 99				Air Mobility Division to be fully involved in AOC assess, plan, & execute process
AFI 13-1AOCV3, Operational Procedures—Aerospace Operations Center	1 Jul 02	Strat Div OA; CO, ISR Div CA	Sort of Describes	Defines	Doesn't define CA, but says ISR Div will do BDA, MEA, RR, and MA

Publication	Date	Assessment Responsibility	Mention of CA		Notes
AFI 14-117, Air Force Targeting	1 Jul 98	Targeteers w/ A-3 & A-5	Defines		Peculiar def. of CA = BDA+MEA+MA
AFPAM 14-118, Aerospace Intelligence Preparation of the Battlespace	5 Jun 01		Mentions	Defines	Targeteers & CA should concentrate on supporting OA
AFPAM 14-210, USAF Intelligence Targeting Guide	1 Feb 98	JFC J-3, assisted by J-2; JAOC CA cell	Defines		Best discussion of operational-level assessment; peculiar def. of CA = BDA+MEA+MA; CA assesses tactical, operational, and campaign levels
AFOTTP 2-3.2, Air and Space Operations Center	25 Oct 02	Strat Div OA, ISR Div CA; other div. support	Defines	Defines	Describes measures of effectiveness; doesn't explicitly task ISR Div with CA, but does task with BDA, MEA, RR, & MA
AFDCH 10-01, Air & Space Commander's Handbook for the JFACC	16 Jan 03	Strat Div OA, ISR Div CA	Describes	Defines	CA is narrowly focused, OA is more inclusive at operational level

Glossary

AFDCH	Air Force Doctrine Center Handbook
AFDD	Air Force Doctrine Document
AFI	Air Force Instruction
AFOTTP	Air Force Operational Tactics, Techniques, and Procedures
AFPAM	Air Force Pamphlet
AOR	Area of Responsibility
ATO	Air Tasking Order
BDA	Battle Damage Assessment
C2	Command and Control
CA	Combat Assessment
CAOC	Combined Air Operations Center
COMAFFOR	Commander, Air Force Forces
COMINT	Communications Intelligence
EBO	Effects-Based Operations
HUMINT	Human Intelligence
IADS	Integrated Air Defense System
ISR	Intelligence, Surveillance, and Reconnaissance
J-2	Intelligence Directorate (JFC staff)
J-3	Operations Directorate (JFC staff)
JAOC	Joint Air Operations Center
JFACC	Joint Forces Air Component Commander
JFC	Joint Force Commander
JIC	Joint Intelligence Center
JIPTL	Joint Integrated Prioritized Target List
JP	Joint Publication
MA	Mission Assessment
MAAP	Master Air Attack Plan
MC	Mission-Capable
MEA	Munitions Effectiveness Assessment
MISREP	Mission Report
MoE	Measure of Effectiveness

OA	Operational Assessment
OODA	Observe-Orient-Decide-Act
OPCON	Operational Control
RR	Reattack Recommendation
SAFIRE	Surface-to-Air Fire
SAM	Surface-to-Air Missile
SIGINT	Signals Intelligence
SPINS	Special Instructions
TACON	Tactical Control
TBM	Theater Ballistic Missile
TTP	Tactics, Techniques, and Procedures

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